U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-260 959

Air Pollution Abstracts
Volume 4, Number 12
December 1973
31611-31984

Environmental Protection Agency, Research Triangle Park, N C

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PB 260 959

Volume 4 No. 12
December 1973
APABCA-4(12)(1973)
US ISSN 0027-5956

AIR POLLUTION ABSTRACTS

31611-31984

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO. APABCA-4-12-1973	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE Air Pollution Abstracts Volume 4, No. 12		5. REPORT DATE December 1973 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Air Pollution Technical Information Center Research Triangle Park, North Carolina 27711		10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS Same		13. TYPE OF REPORT AND PERIOD COVERED 14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

16. ABSTRACT

This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 31611 - 31984.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air pollution Abstracts Information retrieval		13B 5B

18. DISTRIBUTION STATEMENT Unlimited	19. SECURITY CLASS *(This Report)*	21. NO. OF PAGES 98
	20. SECURITY CLASS *(This page)*	22. PRICE $5,00

EPA Form 2220-1 (9-73)

AIR POLLUTION ABSTRACTS

VOLUME 4, NO. 12 DECEMBER 1973

Prepared by
Air Pollution Technical Information Center (APTIC)
Research Triangle Park, North Carolina 27711

Subscribers receiving 'Air Pollution Abstracts'
directly from the U. S. Government Printing Office
should address any inquiries regarding issues
subsequent to June 1972 to:

U. S. Government Printing Office, Washington, D. C. 20402

The Administrator of the Environmental Protection Agency has determined that the publication of this periodical is necessary in the transaction of public business required by law of this Agency. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through March 31, 1975.

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Author Index AI-1

Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given.

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Acknowledgement is given to the Technical Publications Branch, Informational Services Division, Office of Administration, Research Triangle Park, N.C. for the make-up of the cover and for arrangement of printing and distribution.

Feedback from our users, including suggestions of articles, are always welcome.

APTIC Publications

Air Pollution Aspects of Emission Sources: Primary Lead Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:126, $0.65.

Air pollution Aspects of Emission Sources: Primary Copper Production - A Bibliography with Abstracts, June 1973 GPO No. EP 4.9:125, $0.70.

Air Pollution Aspects of Emission Sources: Pulp and Paper Industry - A Bibliography with Abstracts, March 1973, GPO No. EP 4.9:121, $2.35.

Air Pollution Aspects of Emission Sources: Primary Aluminum Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:119, $0.90.

Mercury and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:114, $1.25.

Odors and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:113, $3.00.

Air Pollution Aspects of Emission Sources: Petroleum Refineries - A Bibliography With Abstracts, July 1972, GPO No. EP 4.9:110, $1.25.

Air Pollution Aspects of Emission Sources: Iron and Steel Mills - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:107, $1.00.

Air Pollution Aspects of Emission Sources: Boilers - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:105, $2.00.

Hydrochloric Acid and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:100, $0.55.

Chlorine and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:99, $0.55.

Air Pollution Aspects of Emission Sources: Electric Power Production - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:96, $2.25.

Air Pollution Aspects of Emission Sources: Cement Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:95, $0.50.

Air Pollution Aspects of Emission Sources: Sulfuric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:94, $0.65.

Air Pollution Aspects of Emission Sources: Nitric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:93, $0.45.

Air Pollution Aspects of Emission Sources: Municipal Incineration - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:92, $1.00.

Photochemical Oxidants and Air Pollution: An Annotated Bibliography (2 Volumes), March 1971, GPO No. EP 4.9:88, $6.25.

Beryllium and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:83, $0.40.

Asbestos and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:82, $0.50.

Municipal Incineration: A Review of Literature, June 1971, GPO No. EP 4.9:79, $1.00.

Hydrocarbons and Air Pollution: An Annotated Bibliography (2 Volumes), October 1970, GPO No. HE 20.1309:75, $5.00.

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SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

1973

31611 **APTIC NO. 53846**

Tokyo Metropolitan Government (Japan), Bureau of Environmental Protection

A RESULT OF INVESTIGATION ON THE EMISSION FACTORS OF AIR POLLUTANTS (N0. 1). *(Taiki osen busshitsu haishutsu keisu sanshutsu chosa kekka ni tsuite). Text in Japanese. 16p., June 1973.*

The total amount of air pollutants discharged in Tokyo was calculated to obtain data for control plans and for estimations of the air pollution at various emission sources. Boilers, open-hearth furnaces, metal melting furnaces, metal heating furnaces, kilns, drying furnaces, electric furnaces, incinerators, and other stationary sources were selected for the investigation of sulfur oxides, nitrogen oxides, floating dust, carbon monoxide, hydrocarbons, and aldehydes. Sulfur oxide and carbon monoxide levels were similar to those allowed by U. S. Environmental Protection Agency standards; nitrogen oxide, floating dust, hydrocarbon, and aldehyde levels were smaller. The nitrogen content of fuels is less, better fuels are used, and boiler operating conditions and structure are different in Japan than in the U. S.; thus NOx emissions are less.

31612 **APTIC NO. 53847**

Tokyo Metropolitan Government (Japan), Bureau of Environmental Protection

A RESULT OF INVESTIGATION ON THE EMISSION FACTORS OF AIR POLLUTANTS (N0. 2). *(Taiki osen busshitsu haishutsu keisu sanshutsu chosa kekka ni tsuite). Text in Japanese. 19p., Aug. 1973.*

The automobile was investigated as a mobile pollutant source in Tokyo. Emission factors were calculated using data from field investigations of cars running on Tokyo roads. Using this data, engine operating modes for automobiles in Tokyo were decided and the automobile exhaust gas was measured for each mode. Carbon monoxide, hydrocarbon, nitrogen oxide, aldehyde, sulfur oxide, and floating dust concentrations were determined. The amount of CO from a light car was 1.4 times that from the usual gasoline car; HC was 5.4 times; and NOx was 0.1 times.

31613 **APTIC NO. 53848**

Tokyo Metropolitan Government (Japan), Bureau of Environmental Protection

A RESULT OF INVESTIGATION ON THE EMISSION FACTORS OF AIR POLLUTANTS (N0. 3). *(Taiki osen busshitsu haishutsu keisu sanshutsu chosa kekka ni tsuite). Text in Japanese. 18p., Aug. 1973.*

The total amount of sulfur oxides, nitrogen oxides, carbon monoxide, hydrocarbons, floating dust, and aldehydes discharged from sources in Tokyo was studied. Twenty-four combustion facilities and 10 hydrocarbon related factories were investigated. Five kinds of cars were studied on 12 main and six auxiliary roads in Tokyo. Using the modes determined from the field test, the amount of pollutants exhausted was measured for 36 different cars, and emission factors were calculated. The total exhausted SOx in 1972 was estimated to be 81,599 tons/yr, of which 95.6% are exhausted from fixed emission sources. The total NOx amount was estimated to be 96,364 tons/yr, of which 31% came from fixed sources and 69% from mobile sources. The total CO amount was estimated to be 593,221 tons in 1972.

31614 **APTIC NO. 53764**

Aoyama, Hyogoro, Natsuko Futsuhara, Katsuhiko Uchibori, Seiichi Nakamura, Naoomi Yamaki, Akira Yosizawa, Shinichi Hamanaka, and Masakazu Terada

STUDIES ON THE DRIVING PATTERN AND EXHAUST EMISSION OF AUTOMOBILES PART II AUTOMOBILE DRIVING PATTERN AND ITS RELATION TO EXHAUST EMISSION IN TOKYO TRAFFIC. *(Jidosha no soko jokyo to haiki emishon ni kansuru kenkyu (Dainiho) -- Shutoshite jidosha soko jokyo to haiki emishon to no kankei ni tsuite). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 8(3):68-79, May 1973. 5 refs.*

A vehicle equipped with a proportional sampler was used to determine driving patterns and exhaust emissions from automobiles in Tokyo, Japan. The relation between the average vehicle speed and exhaust emissions was studied also. The average vehicle speed for the whole study run from Oct. to Dec. of 1970 was 16.6 km/hr, and it was decreased by 2.2 km/hr (12%) compared with the average speed in the first part of the study. It was assumed that this result was mainly caused by more acute traffic congestion than before. Emissions, expressed as g/km traveled, were decreased as the average vehicle speed was decreased regardless of the characteristics of the specific route. These were best shown as a logarithmic function of g/km versus vehicle speed. Nitrogen oxides showed a tendency to increase in the exhaust gas as the average speed was increased. But emissions of g of NOx/km were not related to the change of the average vehicle speed.

31615 **APTIC NO. 53637**

Billings, Charles E. and Russell L. Valentine

OPERATING CHARACTERISTICS OF THE CONWAY MUNICIPAL OPEN PIT INCINERATOR. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 26p., 1973. 13 refs. (Presented at Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-221.)*

The open pit incinerator (trench incinerator) concept has been proposed as an economical alternative to prohibited open burning dumps for the reduction of municipal waste volume in rural communities. A 24 ton/day experimental prototype unit has been built by the University of New Hampshire for the town of Conway, a small northern New Hampshire resort community (5000 permanent population; 30,000 transient vacation population). The unit handles typical mixed municipal refuse from individual residents, commercial and industrial establishments, and private disposal contractors (5 to 6 refuse packer loads per week day, 16 cu yds each, approximately 4 to 8 tons/load in winter; and 10 loads per day in summer). Particulate emission tests indicate an average outlet concentration of 1.2 gr/scf (10 lbs/ton of refuse charged). Gaseous emissions average 300 ppm carbon dioxide (17 lbs/ton) and 4 ppm oxides of nitrogen (0.2 lbs/ton). The estimated refuse volume reduction amounts to 85% (65% weight reduction). The pit processes from 10 to 50 tons/day of refuse, and appears to overload on 5 days out of 7 observed. Reported expenditures associated with capital costs total $97,448, or $4060 per ton per day of capacity (9000 tpy est.). Operating costs average $4.24 per ton of waste charged. (Author abstract)

31616 **APTIC NO. 53687**

Bobrischev-Pushkin, D. M., L. A. Naumova, and S. P. Surikova

POSSIBLE POLLUTION OF THE INDUSTRIAL ATMOSPHERE WITH BERYLLIUM COMPOUNDS IN SMELTING BRG-2 BRONZE. *(Vozmozhnost zagryazneniya vozdushnoy sredy tsekhov soedineniyami beriliya pri plavke bronzy BrG-2). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 6:8-10, 1973.*

The production of the BrG-2 metal alloy is attended by the release into the atmosphere of beryllium at all technological stages. During smelting the intensity of the beryllium release was dependent largely upon the type of the charge. It is highest at the time of resmelting the alloy waste cutting. Setting up of an independent local ventilation system in the area of the beryllium alloy smelting has greatly improved work conditions of the foundry workers. But failure to adhere to the instructions on the smelting technology and ventilation service may result in the beryllium compounds escaping into the industrial atmosphere in amounts exceeding the maximum permissible level. It was recommended that the smelting and pouring of the BrG-2 alloy be done in a special isolated premise meeting sanitary standards specified for dealing with beryllium and its compounds. The smelting unit, as well as the site of metal pouring, casting, and slag storage should be provided with shelters with local mechanical exhaust ventilation with filtration of the release air.

31617 **APTIC NO 53831**

Bricker, Paul W.

DESIGN AND CONSTRUCTION OF THE HARRISBURG INCINERATOR. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1973. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-228.)*

The design and construction of Harrisburg, Pennsylvania's municipal incinerator are discussed. The incinerator, which is nearing completion, will meet anticipated refuse disposal needs for at least 25 or 30 years and will allow the discontinuance of obsolete landfill and incineration practices. The basic refuse burning system consists of two water walled, steam generating, furnace-boiler units and electrostatic precipitator dust collection systems. A bulky waste reduction system capable of handling waste lumber, furniture, major appliances, tires, and similar items has also been included. Construction plans and specifications were prepared to set forth the layout of major equipment, the minimum requirements for performance, and the quality of materials. The selection of all equipment, piping, and control systems was the responsibility of the successful bidder. Bidders were permitted to present proposals for the basic system described by the plans and specifications or for alternative systems provided that certain detailed performance guarantees could be met. Bids for a general construction contract and three minor contracts amounted to about $11,500/ton/day of the installed capacity of 720 tons/day. Total financing required to cover all projects costs amounted to $12,500,000. Steam generated in the waste heat boilers is used for various in-plant processes, or is condensed and returned to the boiler feed water system. Plans are being made for other steam uses in connection with sewage sludge drying and incineration facilities to be provided for upgrading and expansion of the City's wastewater treatment facilities. (Author abstract modified)

31618 **APTIC NO. 53801**

Chang, T. Y. and B. Weinstock

URBAN CO CONCENTRATIONS AND VEHICLE EMISSIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 25p., 1973. 14 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-81.)*

The effect of the general growth of carbon monoxide vehicular emissions in urban areas on the CAMP station measurements in downtown areas, where vehicular traffic is saturated, is considered. With the assumption that the street level CO concentration is derived from the sum of an urban background term and a local street effect term, the urban background CO concentration is computed with a diffusion model by introducing a simple area source distribution. The local street effect term is taken to be constant at a saturation emission level corresponding to a saturation traffic density when the emission per vehicle-mile and meteorological conditions are fixed. The present analysis indicates that the local street effect term, Delta C, has a major role in determining street level concentrations for pollutants such as CO whose air quality standard is based on maximum concentrations with averaging times of 1 hr and 8 hr. This analysis could be used as a more appropriate weighting factor for the driving cycle used to evaluate vehicle emissions than the total tonnage concept on which it is based. Also, while the Clean Air Amendments of 1970 require 3.4 g/mi CO vehicle emissions to achieve a desired air quality (DAQ) of 9 ppm for 8 hr from the present air quality of 44 ppm (observed on a single day in Chicago), the present analysis yields 16.7 g/mi CO emissions as a reasonable estimate to achieve a DAQ of 9 ppm. (Author abstract modified)

31619 **APTIC NO. 53751**

Daessler, H.-G., S. Boertitz and E. Auermann

STUDIES OF THE FLUORINE EMISSIONS FROM SOFT COAL-FIRED POWER PLANTS. *(Untersuchungen ueber Fluor-Immissionen aus Braunkohlen-Kraftwerken). Text in German. Z. Ges. Hyg. Ihre Grenzebiete (Berlin), 19(8):568-570, 1973. 19 refs.*

Because of reports of massive bee-kills in the vicinity of soft-coal operated power plants, the fluorine concentration in soft coal samples as well as in filter ash from these power plants was determined. From 10 strip mines in East Germany, 68 soft coal samples were taken according to geological aspects. After drying and grinding of the samples, the fluorine was separated by distillation and determined by colorimetry. The filter ash samples were distilled without ashing. In all examined soft coal samples, fluorine was found. The fluorine concentration was between 6 and 50 g/ton in East Elbe soft coal and between 2 and 178 g/ton in West-Elbe soft coal. At the combustion only part of the fluorine remains in the ash, the rest leaves in gaseous form. The filter ashes contained fluoride up to more than 400 ppm fluoride, chloride, and high quantities of sulfide.

31620 **APTIC NO. 53810**

Gruemm, H.

LIMITS OF ENERGY GENERATION. *(Grenzen der Energieerzeugung). Text in German. VGB Kraftwerkstechnik, 53(8):508-515, Aug. 1973. 13 refs.*

The fossil fuel reserves will last until approximately the year 2100 according to cautious calculations and based on the present consumption growth rate. Nuclear power has come just at the right time to avoid a disaster. It will be possible to cover the growing demands of a larger and more demanding world population with nuclear power. The emission of sulfur, oxides of nitrogen, and dust poses no major difficulty since the retention of these substances is technically feasible. It is impossible, however, to remove the carbon dioxide developing at combustion processes. Presently more than six billion tons of carbon are burned annually. The effects this will have on our climate cannot be forecast yet. A limit to the use of nuclear power is set by the waste heat. But this problem must be faced with any thermal plant. Based on a world population of 20 billion and a per capita consumption of 20 kWt, the atmospheric temperature would rise by 0.2 C. In the nearer geological past, fluctuations of the average temperature of up to 2 C occurred and the human race withstood the climatic changes accompanying temperature fluctuations.

31621 **APTIC NO. 53624**

Kraus, F.

THOUGHTS IN CONNECTION WITH THE CONSTRUCTION AND OPERATION OF NEW CEMENT WORKS. *(Gedanken beim Bau und Betrieb neuer Zementwerke). Text in German. Zement-Kalk-Gips (Wiesbaden), 26(8):356-363, 1973. 39 refs.*

The dust emission of modern cement works can be easily reduced to less than 150 mg/cu m. The dust is non-toxic and the concentration negligible compared to the air pollution caused by the population in large cities. The same is true for the gaseous emission. The sulfur entering with the raw material is nearly entirely bound in the combustion product. Electrostatic precipitators should be designed to guarantee a dust concentration in the cleaned gas of 50 mg/cu m. The installation of two units is recommended. Secure adequate plant operating areas and raw material deposits are needed in order to meet the anticipated rate of increase of demand for cement even in the long run. These areas should preferably be located on sea coasts. New and rational large units that will not require continual modification and extension can be set up on seagoing ships. Rational transport routes, on land and water, for movements of capital goods, raw material and finished products, including the setting up of transfer and transshipment points, must be provided.

31622 **APTIC NO. 53661**

Laskowski, Wladyslaw

THE CHEMICAL COMPOSITION OF DUSTS RESULTING FROM ALLOY PRODUCTION IN OPEN-HEARTH ELECTRIC FURNACES. *(Sklad chemiczny pylow z produkcji stopow w otwartych elektrycznych piecach lukowych). Text in Polish. Wiad. Hutnicze (Warsaw), 29(3):86-91, March 1973. 9 refs.*

The chemical composition of dusts resulting from alloy production in open-hearth electric arc furnaces depends upon the physico- chemical properties of the raw materials, the compounds created during the technological processes, and the parameters and type of the technological processes. The latter may be purely mechanical, such as grinding, mixing, and sifting, which generate mechanical dusts. Their composition does not differ from that of the raw material and product obtained. The dusts generated in open-hearth furnaces are subject to condensation. All raw materials used contain the most common elements, such as silicon, aluminum, iron, calcium, sodium, potassium, and magnesium as essential components or as pollutants. With the exception of iron, these elements are light and form 80 to 100% of condensation dusts. As pollutants they appear in bigger quantities in the dusts than in the product. Accurate knowledge of the raw material composition permits an accurate estimate of the qualitative chemical composition of the main dust mass emitted during production. When there is a tendency for formation of compounds typical for the magmatic rocks, the quantity of the magnesium in the dust emitted does not increase to the same extent as that of the rest of the elements. The iron content in the dust is insignificant, while manganese appears in significant quantities in the emissions. In order to control the chemical composition and the size of the dusts emitted, certain compounds should be added to the charge, and the surface of the melted slag should be cooled. Also the construction materials used are important. The bottoms and the walls of the furnace boilers should be protected with firebricks, magnesite bricks, coal blocks, and electrodic mass. An analogy is made between the melting processes in the open-hearth ovens and the cooling process of the earth.

31623 **APTIC NO. 53728**

Masek, Vaclav

THE CONCENTRATION OF TAR SUBSTANCES IN THE ATMOSPHERE OF WORKING PLACES. *(Teersubstanzen-Gehalt in der Atmosphaere der Arbeitsstaetten). Text in German. Zentr. Arbeitsmed. Arbeitsschutz, 23(8):225-228, Aug. 1973. 6 refs.*

In 1972 a number of air samples were taken with silver membrane filters (pore size 0.45 micron, diameter 47 mm) on selected places in two coal and one pitch coking plant. After determination of the dust concentration of 5-hour extraction with purest benzene followed. The benzene solution was then filtered with another silver membrane. Its weight increase was added to the weight of the first membrane after extraction. The total mass of tar substances divided by the quantity of air drawn through the membrane yielded the concentration of tar substances in mg/cu m. In the extracts, the benzo-3,4-pyrene concentration was determined chromatographically on activated alumina and photometrically with the aid of Spekol at a wavelength of 367 nm. Samples were also taken at some points in the open air in a large metallurgical plant. The results showed that the concentration of tar substances was rather high, particularly in the air of coking plants and in their vicinity. Polycyclic substances represented by benzo-3,4-pyrene were present in all samples, particularly in those from the pitch coking plant. In these the tar substance concentrations in fly dust samples were nearly twice as high as in samples from hard coal coking plants.

31624 **APTIC NO. 53939**

McGowin, Charles R.

STATIONARY INTERNAL COMBUSTION ENGINES IN THE UNITED STATES. (FINAL REPORT). *Shell Development Co., Houston, Tex., Bellaire Research Center Environmental Protection Agency, Office of Research and Monitoring Contract EHSD 71-45, Task 24, Program Element 1A2014, Rept. EPA-R2-73-210, 118p., April 1973. 46 refs.*

NTIS: PB 221457

A survey of stationary reciprocating engines in the United States was conducted to compile the following information: types and applications of engines; typical pollutant emissions factors for diesel, dual fuel, and natural gas engines; differences between engines that cause emissions to vary; total horsepower and emissions from engines; pollution potential of stationary engines in densely populated regions; and potential emissions control techniques. Gas turbines were included in the survey where appropriate. The results gave an estimated 34.8 million horsepower of reciprocating engines and 35.5 million horsepower of gas turbines operating in the United States during 1971. The principal functions of the engines were: oil and gas pipelines (35%), agriculture (22%), and electric power generation (16%). Total oxides of nitrogen emissions from engines appear to be 2.2 million tons annually, of which 42% are generated by pipeline engines. Carbon monoxide and hydrocarbon emissions appear to be an order of magnitude lower. Emissions control techniques having potential as short to intermediate term solutions include precombustion chambers for diesel engines and water injection and valve timing modifications for gas and diesel engines. Catalytic reduction of NOx appears to have the greatest potential over the longer term. (Author abstract modified)

31625 **APTIC NO. 53837**

Phillips, Michael A.

INVESTIGATIONS INTO LEVELS OF BOTH AIRBORNE BERYLLIUM AND BERYLLIUM IN COAL AT THE HAYDEN POWER PLANT NEAR HAYDEN, COLORADO. *Environ. Letters, 5(3):183-188, 1973. 4 refs.*

The levels of both airborne beryllium and Be in coal at the Hayden Power Plant near Hayden, Colo. were investigated. In July 1972, coal, spoil, and fly ash samples were collected from the plant. The coal was from the Seneca Mine, and it burned to produce an ash weight of 7% which means that for each 100 lbs of coal burned, 31 ppm or 84% has presumably been lost to the surrounding atmosphere. In Oct. 1972, a direct atmospheric sampling was made by a high-volume air sampler. Gelman Type A fiberglass paper reported a background level of Be of 0.0016 micrograms/sq in. This value equates to 0.0004 micrograms/cu m of air after being corrected for paper area, sampling rate, sampling time, and local atmospheric pressure. With no increase of the present antipollution devices in use at the plant, it is possible that a major expansion (three to four times present coal usage) could elevate the level of airborne Be to that experienced by industrial areas (.001-.002 micrograms/cu m).

31626 **APTIC NO. 53826**

Schmidt, Alfred

FERTILIZERS - PRESENT STATE OF THE ART AND DEVELOPMENT TRENDS. *(Duengemittel - Gegenwaertiger Stand und Entwicklungstendenzen). Text in German. Chemiker-Ztg. (Heidelberg), 97(8):401-408, Aug. 1973. 40 refs.*

In the last ten years world consumption of fertilizers has more than doubled and will continue to rise if only at a smaller rate. In the fertilizer industry this has resulted in numerous new developments and improvements of the manufacturing processes of the fertilizer materials already on the market. Special attention has been drawn to large single-train plants for the ammonia synthesis, on the direct production of concentrated phosphoric acid and on the production of multinutrient fertilizers. On the other hand, new products such as superphosphoric acid and polyphosphates, potassium phosphate, and potassium nitrate could not gain ground in the market. Particularly hard efforts were made to reduce the pollution by fertilizer factories. Here success was reached in greatly reducing the emission of nitrogen oxides in nitric acid plants by applying higher absorption pressures and in finding fields of application for the gypsum and the hexafluorosilicic acid from the production of phosphoric acid. Apart from this, the effects of fertilization on the quality of the agricultural goods produced and on possible influences on subsoil and surface waters have been investigated in detail. Plants which process ammonium nitrate or ammonium nitrate containing fertilizers at higher temperatures produce waste gases which are called blue smoke. They develop through slight thermal dissociation of ammonium nitrate. These gases can be cleaned in an electrostatic precipitator or in a venturi scrubber. Because of the large waste gas quantities, the costs for this cleaning are enormous. Efforts should be rather aimed at the prevention of these waste gases. In general it can be said that the fertilizer industry has no major emission problems.

31627 **APTIC NO. 53900**

Skawina, Tadeusz

THE THREAT TO THE ENVIRONMENT CAUSED BY THE MIASTECZKO SLASKIE ZINC SMELTING PLANT AS WELL AS POLLUTION CONTROL AND IMPROVEMENT GUIDELINES. *(Zagrozenie srodowiska w rejonie huty cynku Miasteczko Slaskie oraz kierunki przeciwdzialania i naprawy szkod). Text in Polish. Zesz Nauk. Akad. Gorn.-Hutn. Stanislawa Staszica Zesz. Spec., 47(400):149-157, 1973. 3 refs.*

An investigation was conducted to establish the threat of the Miasteczko Slaskie zinc smelting plant to the environment. The zinc smelting plant was not the only industry polluting the region. The plant pollutes the air with gaseous, solid, and liquid substances, including carbon dioxide, carbon monoxide, sulfur dioxide, dusts containing calcium, magnesium, iron, silicon, aluminum, potassium, zinc, lead, cadmium, sulfur, arsenic, and coke. The main sources emitting to the atmosphere are: the Prevalov ovens, emitting 30% zinc and lead oxides per 16 kg/ton of metal produced; the four coking chamber chimneys emitting 50% zinc and lead per 6 kg/ton loads; the shaft furnace emitting dusts with a content of 40% zinc per 5 kg/t; the lead refinery, emitting dusts with traces of zinc and 25% lead per 1 kg/t of lead processed; and the sulfuric acid plant, emitting a sulfuric acid fog. Additional sources of dust and SO2 are the boiler and the magnesium oxide calcium pile and its transportations to customers. The height of the emitters varies from 20 to 120 m. The noxious effect of SO2 was observed before the plant was built. Other industries, such as the Tarnowskie Gory Chemical Plant and the Siersza Electrical Works emit larger quantities of SO2 to the atmosphere. The existence of the zinc smelting plant increased the threat to the environment, since the dust and gaseous emissions load considerably increased, leading to marked changes in the forest vegetation. Before the zinc plant started, the emissions varied from 92 to 114 t/sq km/yr. After the plant started, the emissions were 170 t/sq km/yr. In the vegetation growing around the zinc plant, the lead content is 40 times higher, and the zinc content five times higher than the natural level. A significant alkalinization of the soils was observed in the zone of intensive dust emission, a higher content of heavy metals, and a tendency to acidification, especally where SO2 emissions prevail. The protective measures include planting of protective vegetation belts, and rational agricultural exploitation of the terrains threatened with strongest emissions.

31628 **APTIC NO. 53723**

Tellier, Guy

INCINERATION OF RUBBER AND PLASTIC WASTES. *(L Incineration des dechets de caoutchouc ou de plastique). Text in French. Rev. Gen. Caout. Plast., 50(3):157-159, March 1973.*

General problems posed by the elimination of rubber and plastic wastes are examined regarding the destruction of old tires: disposal in the sea, crushing after liquid nitrogen bath, pyrolysis, and incineration. A rotating furnace with a distillation chamber and a post-combustion chamber allowing temperatures up to 1200 C is suggested. A water sprinkling system assures temperature regulation (200 l/1 ton old tires/1 hr). Rotation assures burning of combustible material. Gas emissions at 90 tires/hr are 5-5.8% carbon dioxide, undetectable carbon monoxide, and 15-18 ppm nitrogen oxides; dust before scrubbing is 120 mg/n cu m and after scrubbing is 30 mg/n cu m.

31629 **APTIC NO. 53874**

Tsunoda, Humio

AIR POLLUTION CONTROL BY FLUORIDES FROM PRIMARY ALUMINUM SMELTING. *(Aruminyumu seiren kogyo ni okeru fukkabutsu ni yoru taikiosen boshitaisaku). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(4):376-381, April 1973. 12 refs.*

A prebake aluminum smelter gives easier air pollution control than the Soderberg automatic continuous burning anode system. The fluoride emitted from the electrolytic bath is removed by the double system of a bath-hood cleaner and chamber-ceiling cleaner. Hydrogen fluoride and tetrafluorosilicon are mostly emitted. Removal for the Soderberg and Prebake systems are 92-99% and 80-97% of the fluoride, respectively. A wind tunnel study was used to estimate the ground level concentration of gaseous fluoride dispersed by a line emission source. There is a close relationship between ground level and wind velocity and direction. The effects of fluorides on plants and animals and the composition of fluoride compounds emitted by aluminum smelters are reviewed.

31630 **APTIC NO. 53899**

Vallee, Bert L.

ARSENIC. *Air. Qual. Monogr., 73-18:1-41, 1973. 87 refs.*

Arsenic is discussed. Its natural occurrence in the environment, uses, occurrence in the air, water, soil, food and drink are reviewed. Various methods for analyzing its concentration and presence are described, including chemical methods, atomic absorption spectrometry, emission spectroscopy, neutron activation analysis, and spark source mass spectrometry. The chemical and biochemical aspects of arsenic are reviewed. Air quality standards in relation to the toxicity and pharmacology or arsenic are presented. Pertinent literature reviews are included.

31631 **APTIC NO. 53733**

Walkenhorst, Wilhelm

THE QUANTITY OF THE FINEST FRACTION TO ONE MICRON AMONG THE RESPIRABLE DUST. *(Beitrag der Feinstfraktion bis 1 mikron zum atembaren Staub). Text in German. Staub, Reinhaltung Luft, 33(8):307-312, Aug. 1973. 21 refs.*

Electron micrographs of respirable suspended dust in working places (5 micron 50%, 7 micron 0%) are evaluated according to the number and size of particles. From this the surface, volume and mass are determined. The finest particles up to 0.5 micron must always be disregarded, the amount of particles up to 1 micron is between 2.4 and 7.6% of the mass. If the air pollution is not taken into consideration, the values are reduced to 2.0 and 5.75%. The surface up to 1 micron amounts from 8.4 to 41%, but without air pollutants it decreases to 5.8 and 18.2%. For sampling alumina, diaphragms with pore sizes of 0.02 micron were used. Samples were taken in a coal mine, during drilling operations in Ruhr sandstone, and in a casting cleaning station.

31632 **APTIC NO. 53594**

Wanner, Peter

MELTING INSTALLATION WITH MAINS FREQUENCY CORELESS INDUCTION FURNACES AND SCRAP PREHEATING IN AN IRON FOUNDRY. *Giesserei (Duesseldorf), 60(17):510-515, 1973. 1 ref.*

In modern melting installations it is necessary to plan and build the furnaces jointly with the associated equipment. A centrally controlled installation in a Swiss jobbing foundry is described, consisting of charge make-up equipment, tumbling barrel, furnace charging equipment and coreless induction furnaces with preheaters. Also included is the necessary apparatus for quality assurance and environmental protection. The dusty air is drawn off at three points, from the tumbling barrel 20,000 cu m/hr, the preheater 25,000 cu m/hr, and above the furnace platform 40,000 cu m/hr. The dusty air leaving the tumbling barrel and the waste air from the preheater are cleaned in wet filters to a residual dust concentration of 50 mg/cu m. The waste water from the wet filters for preheating is neutralized. A bag filter is used to clean the air drawn off from the furnace platform to a level of 25 mg/cu m.

31633 **APTIC NO. 53913**

Wiedersum, George C. and Sumner Barr

THE EFFECT OF POWER PLANT STACK EMISSIONS ON THE GROUND LEVEL SO2 CONCENTRATIONS IN AN URBAN AREA. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 25p., 1973. 10 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill. June 24-29, 1973, Paper 73-123.)*

The effect of power plant stack emissions on the ground level sulfur dioxide concentrations in Philadelphia, Pa., is discussed. A test was made in which high (over 2%) sulfur and low (below 1%) sulfur fuel was alternately burned for periods of 4-9 days in all six power plants within Philadelphia. These plants accounted for about 40% of the total SO2 emissions in the city when burning high S oil. A 15 station air sampling network was established, with 4-hour resolution; and extensive meteorological data were taken during the test duration of more than 3 mo. Simple arithmetic averaging of the ground level SO2 measurements from the network produced the unexpected result that they were 22% higher when low S oil was burned than when high S fuel was used. To investigate these anomalous results, a computer assisted analysis was made of the test data. This analysis demonstrated that the sampling network did measure increased SO2 levels during the high S oil periods, but only in the limited portion, about 5%, of the metropolitan area that was within the boundaries of influence of the power plant stack plumes. Although the aggregate of the power plant stack emissions represented a significant proportion of the total urban source, when these emissions were reduced by over 50%, the net improvement in air quality was marginally above the noise level. This indicates that low level emission sources have a proportionately greater effect on ground level concentrations in the urban area than do elevated sources. (Author abstract modified)

31634 **APTIC NO. 53763**

Yamaki, Naoomi, Katsuhiko Uchibori, Hyogoro Aoyama, Seiichi Nakamura, Hidetoshi Shimizu, Motoatsu Shiraishi, and Takeo Fukui

STUDIES ON THE DRIVING PATTERN AND EXHAUST EMISSION OF AUTOMOBILES. PART I. SURVEY OF AUTOMOBILE DRIVING PATTERN IN TOKYO. *(Jidosha no soko jokyo to haiki emishon ni kansuru kenkyu (Daiippo) - Tokyo tonai ni okeru jidosha soko jokyo no kaiseki). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 8(3):50-67, May 1973. 10 refs.*

To investigate the driving pattern and exhaust emissions of automobiles, a 1966 model domestic passenger car having a 2000 cu cm engine was operated under actual traffic conditions over 21 main arterial roads in Tokyo from Nov. 1968 to Jan. 1969. The operating condition of the car was recorded on a four-channel recorder by the engine tacometer, speedometer, and the intake manifold vacuum gauge. These data were utilized for various analyses using a small computer. From a series of such runs, the general trend of vehicle operating conditions in Tokyo was clarified. The following aspects were analyzed to determine the operating condition: average vehicle speed; percentage time spent on each specific divided range of acceleration, deceleration, cruising speed, intake manifold vacuum, and engine rpm in operation; percentage time spent on each of the four driving modes (idling, acceleration, cruising, deceleration); engine load condition (engine rpm versus manifold vacuum mm Hg); percentage time spent of each position of a manual transmission; grouping of driving pattern as per its characteristics, and its frequency per each group defined; and number of stops caused by traffic signals.

1972

31635 **APTIC NO. 53694**

Cheremisinoff, Paul N. and Kottapalli B. Rao

FLUID BED INCINERATION. *Ind. Gas., 52(3):22-25, March 1972.*

The use of fluid bed incineration in the combustion of solid and liquid wastes offers advantages in terms of thermal efficiency and the control of odors and particulate emissions. It can be used to incinerate materials with high water content without the use of supplemental fuel, and is applicable with almost any waste material that can potentially be destroyed by combustion. The principle behind fluid bed incineration is discussed, along with the incineration process and basic system design. Solid wastes can be fed into the incinerator by either screw type or ram feeders, while semiliquid wastes are fed by means of screw pumps; liquid wastes are introduced at the top of the bed in the freeboard area. Fluid bed pyrolysis can be used to convert solid waste materials with high heating values into pipe line gas. With this system, the fluidizing medium is primarily nitrogen with only small amounts of oxygen. A two stage pyrolysis incineration unit can also be used. Destructive distillation occurs, after which pyrolysis gases containing free sulfur can be used in a stoichiometric combustion zone to produce heat. Gases containing sulfur products that can create a nuisance would be subjected to clean-up by adsorption.

31636 **APTIC NO. 53938**

Horie, Yuji

AIR POLLUTION MODELING, SIMULATION, AND CONTROL. *Kansas State Univ., Manhattan, Kansas, Dept. Chemical Engineering, Thesis (Ph.D.), Univ. Microfilms, Inc., Ann Arbor, Mich., 1972, 181p. 280 refs.*

The validity of various urban air pollution models and their applicability under different meteorological and urban conditions was studied, and new mathematical models were developed for simulating, predicting, and controlling urban air pollution that results from both stationary and moving emission sources. The system engineering techniques such as system analysis, mathematical model building, computer simulation, adaptive prediction, and optimal control were used in the study. A thorough review of basic micrometeorology such as indexes of atmospheric stability and formulas of vertical wind and temperature distributions indicated that results of studies on atmospheric dispersion can be classified into three categories: solution to diffusion equation (K-theory), formula based on statistical theory of turbulent diffusion, and similarity theory of atmospheric dispersion. Models of urban air pollution were classified into three groups: heat island model, short-term prediction model, and long-term prediction. Traffic control of urban transportation systems was studied from the standpoint of highway air pollution which arises from heavy traffic on urban streets. A model was developed by considering steady state material balance of airborne pollutants over an urban street. The model can describe pollutant concentrations from information of atmospheric and traffic conditions on the street. Three different traffic control policies were formulated: controlling traffic volume based on the criterion that the sum of benefit gained through the traffic service on the street and benefit obtained from improved air quality by reducing the pollutant concentration over the street is maximum; by assigning the trips of individual vehicles to one of two alternative routes from their origins to their destinations under the same criterion; and assigning the trips of individual vehicles to one of many alternative routes from their origins to their destinations. Results of the three control policies showed that the optimal traffic assignment to the urban street as well as the pollutant concentration over the street are affected significantly by meteorological conditions. (Author abstract modified)

31637 **APTIC NO. 53955**

Pokhodnya, I. K., V. I. Shvachko, V. G. Ustinov, and S. A. Suprun

MASS-SPECTROMETRIC INVESTIGATION OF GASEOUS FLUORIDES FORMED DURING ARC-WELDING. *(Mass-spektrometricheskoye issledovaniye gazoobraznykh ftoridov, dydelyayushchikhsya pri dugovoy svarke). Text in Russian. Avtomat. Svarka, 24(6):10-12, 1972. 9 refs.*

Ion fragments of silicon tetrafluoride, SiF3+, SiF2+, HF+, and F+ ions were identified mass-spectrometrically in the mass spectrum of the gases formed during arc-welding by means of carbonate- fluorite type welding wires. Other mass-spectrometric investigations of titanium tetrafluoride and zirconium tetrafluoride revealed that the mass spectrum of TiF4 is composed of TiF2+, TiF3+ and TiF+ ions, and that of ZrF4 of ZrF4+, ZrF+ and ZrF3+ ions.

1971

31638 **APTIC NO. 53714**

Booz, Allen Applied Research, Inc., Bethesda, Md.

APPENDIX F. DISCUSSION OF METHODS USED TO COMPUTE NOISE AND POLLUTION CONTRIBUTIONS OF AERONAUTICAL SYSTEMS. *In: A Historical Study of the Benefits Derived from Application of Technical Advances to Civil Aviation. Volume II - Appendices B Thru I. Joint Dept. of Transportation/National Aeronautics and Space Administration Civil Aviation Research and Development Policy Study TST-30, Contract DOT-OS-00020, NASA CR-1809, p. F1-F34, Feb. 1971. 17 refs.*

NTIS: PB 198801

This appendix is directed at explaining the computations made in a study of technical aviation advances regarding noise and air pollution created by aircraft operations as perceived by people on the ground. The characteristics of noise and air pollution depend on the number or type of aircraft (defined mainly by engine type and aircraft size) and on the nature and frequency of aircraft operations. The methodology finally employed to determine total noise events can be summarized as follows: The approximate number of takeoffs and landings per year for each aircraft type was determined from domestic air carrier revenue passenger miles per year for each major category of aircraft and from the annual operations in domestic trunks. The ground area influenced by each type on landing and takeoff cycle was determined from the landing and takeoff noise footprints for 90, 100, and 110 PNdb for each type. The number of noise events occurring per year for 90, 100, and 110 PNdb was determined by aircraft type for an assumed population density of 1000 per square mile. An approximation of the magnitude of the pollution problem created by aircraft over the years was obtained as follows: The total pollution over the U. S. (enroute plus airport vicinity) was determined from the number of gallons of fuel used by piston-engine and gas-turbine-engine aircraft and from the pounds of pollutants-per-1000 gallons. The average pollution occurring in the neighborhood of airports was determined from the number of landing and takeoff cycles achieved by each major aircraft type and from the pounds of pollutants-per-cycle.

31639 **APTIC NO. 53944**

Federal Power Commission

THE 1970 NATIONAL POWER SURVEY. PART I. *465p., Dec. 1971.*

A report of the national power survey is presented. The report projects electric load growth over the next twenty years, and discusses changing power technology, growing concerns for all developments, including use of resources and various impacts on air, water, and land, increasing problems in meeting schedules for needed new power facilities, power plant fuel supply problems, and the probable effect of these on the cost of power. The Federal Power Commissions report is intended to serve as a general long-range guide. It illustrates possible patterns of efficient development based upon assumptions outlined in the report. A summary of survey findings is given for the structure of the power industry, the demand outlook, and the supply outlook. The relationship between power and the environment, research and development needs and costs are reviewed. Power sources covered include: electric power, fossil fuels and fuel transport, fossil fuel steam-electric generation, nuclear power, conventional and piped storage hydroelectric power, gas turbines, diesels, and total energy systems. The disposal of waste heat from steam-electric plants, air pollution, the aesthetics and land use of power facilities, transmission and interconnection, distribution systems, utility practices affecting the reliability of supply, problems in timely planning and construction of new facilities, coordination for reliability and economy, and possible patterns of generation and transmission through 1990 are all discussed.

1949

31640 ***APTIC NO. 53702***

McCord, Carey P. and William N. Witheridge

CHEMICAL CONSTITUTION AND ODORS. In: Odors - Physiology and Control. New York, McGraw-Hill, 1949, Chapt. 3, p. 32-39.

No single pattern of structure provides or influences odor properties with respect to either inorganic or organic chemical compounds. Furthermore, few elements in atomic state are accessible to odor appraisal. Only seven elements give rise to odors in the molecular state; these are arsenic, bromine, chlorine, fluorine, iodine, oxygen as ozone, and phosphorus. These seven elements produce only two fundamental odors, alliaceous for arsenic and phosphorus and haloid for the remainder. Odors from inorganic compounds are chiefly offensive and often irritating; while pleasant odors are foremostly associated with organic compounds, though the most offensive odors are likewise products of organic compounds. Many known chemical radicals and molecular arrangements influence odors. (Author summary modified)

31641 **APTIC NO. 53704**

McCord, Carey P. and William N. Witheridge

INDUSTRIAL ODORS. *In: Odors - Physiology and Control. New York, McGraw-Hill, 1949, Chapt. 8, p. 132-147. 11 refs.*

The wastes from such sources as dye works, chemical plants, synthetic-rubber plants, oil wells, refineries, gas plants, coke ovens, wood distillation plants, glue factories, distilleries, and the like commonly contain adequate organic matter of nitrogenous of sulfurous nature to give rise to the noxious products of biological decomposition. The worst of these gases from the standpoint of odor are sulfides, mercaptans, indoles, and amines. Additionally, the waste waters from many establishments contain dissolved gases of malodorous quality that are little affected by the natural forces of self-purification in the watercourse. Finely divided solid or liquid particles of colloidal magnitude emitted from industrial stacks may also carry offensive odors over widespread areas. The solids may either be composed of substances with sufficient vapor pressure to yield an odor or have odorous gases adsorbed on their surfaces. Electric precipitation can be used for the removal of particulates, though the gas and vapors themselves cannot be removed in this manner. Generally stack gases must be treated by the methods of scrubbing, combustion, chlorinating, ozonating, and adsorption. Techniques of industrial process ventilation have greatly reduced the concentration of offensive odors inside industrial plants but at the same time have increased the amount of odorous air contaminants vented to the outside. Hence, deodorizing procedures must also be considered for incorporation into the general or local exhaust systems.

31642 **APTIC NO. 53705**

McCord, Carey P. and William N. Witheridge

THE OFFENSIVE TRADES. *In: Odors - Physiology and Control. New York, McGraw-Hill, 1949, Chapt. 16, p. 148-156. 2 refs.*

A review of the offensive trades, those industries which traditionally are responsible for odorous emissions, reveals no warrant for the setting apart of such industries as requiring peculiar methods for odor prevention and elimination other than general odor prevention and control measures. The gases and vapors associated with operations connected with animal bodies, excreta, and so on are similar to those resulting from petroleum refining and rubber manufacture; and both have the following aspects in common: the gases driven off during concentration are almost entirely soluble; the volume of noxious vapors or gases to be deodorized consists of the air which overlies the charge and is displaced by heating, together with the small quantity of air from the condenser water, and the insoluble gases; such gases and any air which has been in contact with them can be completely deodorized by chlorination. Most of the gases given off during concentration in the offensive trades belong to the amine group. Ammonia and monoethylamine from flesh, together with ammonia and monomethylamine from fish form the largest proportion of these gases, followed by trimethylamine, hydrogen sulfide and dimethylamine from fish, and diethylamine and H2S from flesh. Trimethylamine is the most offensive, apart from a substance which remains undetermined. The maximum rate at which moisture is driven off during concentration is about four times the average rate when the internal temperature of the vessel is 148 C, equivalent to steam at a pressure of 50 lb/sq in. The volume of such gases given off during concentration as well as their noxiousness is greatly increased when the raw material is in a stale condition. No nuisance will be caused by the effluent if the gases are cooled in a condenser to a temperature not exceeding 49 C.

CONTROL METHODS

1973

31643 **APTIC NO. 53716**

Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Monitoring

PRESSURIZED FLUIDIZED-BED COMBUSTION OF COAL. *64p., May 1, 1973. 4 refs.*

The pressurized fluidized bed combustion of coal offers potential both as an air pollution control system and as a combustion boiler system. From the standpoint of an air pollution control system, the process offers a high level of sulfur dioxide control due to: a good limestone-sulfur dioxide reaction temperature, so that dead burning of the sorbent is not a serious problem; good contacting between the sorbent particles and the combustion gases; and longer residence time of the sorbent in the combustion zone, particularly in the case of lime bed systems. It also offers reduced emissions because of the relatively low operating temperatures, which reduce the fixation of atmospheric nitrogen and the reduction of nitrogen oxides in the presence of sulfur dioxide and carbon monoxide to 50 to 140 ppm, particularly in pressurized systems. Finally, it offers reduced particulate emissions, especially fine particulates. From the standpoint of a combustion system, the process offers high bed-to-tube heat transfer coefficients within the bed, high volumetric heat release rates, a smaller boiler with less tube surface, especially with pressurized operations, lower capital and power costs, potentially higher supercritical steam conditions in utility fluidized boilers, the ability to burn poorer grades of fuel more readily than conventional boilers, and reduced ash fouling and high temperature corrosion as a result of the lower operating temperature. (Author summary modified)

31644 **APTIC NO. 53942**

West Virginia Univ., Morgantown, W. Va., Coal Research Bureau

EVALUATION OF DEWATERING OF LIMESTONE WET SCRUBBING PROCESS SLUDGES. (FINAL REPORT). *Environmental Protection Agency, Office of Research and Monitoring Contract EHSD 71-11, Rept. EPA-R2-73-262, 66p., May 1973. 37 refs.*

NTIS: PB 221155

Several methods of dewatering solid materials were applied on bench-scale to wet-collected, limestone-modified fly ash from a coal-fired electric power plant using limestone-injection and wet-scrubbing methods to control the emission of gaseous sulfur oxides. Porous-bed sand filtration, lagooning, and possibly pressure filtration appeared to hold the most promise. Aluminum extraction tests using sodium hydroxide, sodium carbonate, and combinations of the two yielded less than 50% of the aluminum available in the leach liquor. Structural materials testing indicated that there is insufficient free lime available in the modified ash to act as a suitable binding agent. (Author abstract)

31645 **APTIC NO. 53947**

MSA Research Corp., Evans City, Pa., Div. of Mine Safety Appliances Co.

PACKAGE SORPTION DEVICE SYSTEM STUDY. *Environmental Protection Agency, Office of Research and Monitoring Contract EHSD 71-2, EPA-R2-73-202, Program Element 1A2015, 506p., April 1973. 773 refs.*

NTIS: PB 221138

A Package Sorption Device System study was undertaken to achieve the following objectives: identify and characterize the numerous small but objectionable sources of gaseous pollutants; develop ranking of sources according to relative importance; assess the equipment and technology available for controlling these sources; investigate the potential and need for development of new technology and new sorbents; and develop detailed research and development recommendations to improve existing devices or develop new control methods. The primary products of this study are: a handbook on package sorption device technology; an assessment of the emissions to which this technology may be applicable; and the research and development recommendations. Emission sources amenable to control by package sorption devices contribute 15% of the total organic emissions from all sources and can be divided into two broad categories: solvent user industries which emit solvents essentially unchanged, and process industries which generate pollutants by chemical, biological, or thermal reactions. Regenerative activated carbon adsorbent systems show promise for the control of pollutants from these sources, particularly at concentrations below 700 ppm. At higher concentrations, catalytic and thermal incinerators are more economical except where the would-be pollutant is a valuable solvent recoverable by the adsorbent system. Sources include surface coating, degreasing, dry cleaning, printing, rubber manufacturing, rendering, canning and other food processing, and incinerators.

31646 **APTIC NO. 53607**

Aaland, Harold H. and James L. Ma

SULFUR TRIOXIDE VAPOR FOR DUST CONDITIONING. *(Assignee not given.) U. S. Pat. 3,722,178. 6p., March 27, 1973. 5 refs. (Appl. June 24, 1971, 10 claims).*

A process and apparatus for the production of sulfur trioxide for stack gas dust conditioning is disclosed. The process consists of vaporizing and decomposing concentrated sulfuric acid (92 to 98%) by a stream of hot air according to the following equation: sulfuric acid plus heat (840 F) yields sulfur trioxide plus water. The object is to supply necessary heat required for raising the temperature, vaporizing, and decomposing the liquid sulfuric acid by direct contact of the acid with a stream of hot air produced by combustion of a hydrocarbon fuel and an excess of fresh air. The sulfuric acid in this method is not hot until the moment when it is converted into sulfur trioxide and water vapors. The temperature of the gas mixture can be lowered by 200 or 300 F, if required, without causing condensation of the acid since the dew point of the acid vapor is reduced in the presence of air. The SO3 can then be used to condition dust in stack gas by decreasing electric resistance.

31647 **APTIC NO. 53807**

Aigenson, Alexandr Sergeevich, Vladimir Vasilievich Fryazinov, Fatkulla Khairullovich Malikov, Julia Sergeevna Sabadash, Vladimir Stefanovich Akimov, Natalia Ivanovna Dobrozrakova, Genrikh Arturovich Berg, Boris Mikhailovich Ezhov, Georgy Alfonsovich Vorms, Rudolf Kubicka, Yaroslav Veprek, and Yaroslav Cir

METHOD OF PROCESSING HEAVY SULFUR-BEARING PETROLEUM RESIDUES INTO LOW-SULFUR MOTOR AND BOILER PLANT FUELS. *(Bashkirsky Nauchno- Issledovatelsky Institut Po Pererabotke Nefti, Ufa (USSR)) U. S. Pat. 3,714,025. 5p., Jan. 30, 1973. 3 refs. (Appl. July 16, 1970, 4 claims).*

A method of processing heavy sulfur-bearing petroleum residues into low-sulfur motor and boiler plant fuels is presented. The petroleum residues are deasphaltized by being treated with solvents which are paraffin hydrocarbons of four to eight carbon atoms, or a mixture thereof, at a temperature higher than the softening point of the asphaltene concentrate, and under a pressure exceeding that of the solvent vapors at said temperature. Liquid-liquid extraction proceeds with the deasphaltizate comprising resins and oils constituting an extract phase and the concentrate comprising asphaltenes. Metalliferous compounds and ash-forming components with admixtures of resins and oils constitute a raffinate phase. The resulting deasphaltizate is subjected to catalytic destructive hydrogenation on a catalyst composed of metal oxides belonging to Groups VI and VIII of the Periodic System, on aluminum oxide as a carrier, at a temperature of 350-450 C, under a pressure of 100-300 atm, with a space velocity of 0.2-5/hr, and at a volume ratio of hydrogen to the deasphaltizate of 200-2000:1. (Author abstract modified)

31648 **APTIC NO. 53861**

Aine, Harry E.

EXHAUST EMISSION CONTROL MEANS FOR INTERNAL COMBUSTION APPARATUS. *(Assignee not given.) U. S. Pat. 3,739,553. 8p., June 19, 1973. 10 refs. (Appl. June 14, 1971, 2 claims).*

An exhaust emission control device for removing smog-producing constituents from the exhaust of an internal combustion chamber has been developed which employs a membrane gas separator in communication with exhaust gas flow at essentially atmospheric pressure. The gas separator causes unburned hydrocarbons and other smog producing constituents of the exhaust to enter into solution with an elastomer membrane material such as silicone rubber (0.001 to 0.0001 in thickness) which is a barrier to permanent gases and to diffuse from the membrane into a stream of fresh air at atmospheric pressure; the stream is then fed back to the combustion chamber or to an afterburner for completing the combustion of smog producing substances. A relatively large area of membrane material is provided in a relatively small volume by pleating or folding the membrane. Alternatively, a large area per volume can be provided by bonding together adjacent sheet portions of membrane in a certain pattern of bond lines to achieve a honeycomb of alternating exhaust and fresh air gas passageways upon expansion of the bonded structure. (Author abstract modified)

31649 **APTIC NO. 53773**

Amelin, A. G., Ye. V. Yashke, B. T. Vasilev, and R. P. Karpova

EVAPORATION CONDITIONS DURING THE SCRUBBING OF KILN GASES IN THE PROCESS OF CONTACT SULFURIC ACID PRODUCTION. *(Isparitelnyy rezhim promyvki obzhigovogo gaza v proizvodstve sernoy kisloty kontaktnym sposobom). Text in Russian. Khim. Prom. (Moscow), no. 6:435-438, 1973. 9 refs.*

The two-stage, evaporative acid scrubbing of kiln gases in contact sulfuric acid production is described. The first stage of the scrubbing tower uses scrubbing acid with elevated temperature, which causes the water to evaporate and condensate in the second scrubbing tower. As a result, the gas in the first scrubber is cooled off with the use of coolers. The intense condensation of the water vapor in the second scrubber causes enlargement of the sulfuric acid mist particle size, and decrease in the mist sulfuric acid concentration, which facilitates the separation of the sulfuric acid mist particles in a wet type electrostatic precipitator. In an experiment, reduction of the mist concentration from 4.6 g/cu m at the outlet from the first scrubber to 1.1 g/cu m at the outlet from the second scrubber was measured. At the same time, the mist particle concentration decreased from 2,100,000 to 1,200,000/cu m, and further to 120,000/cu m at the outlet from the first stage of the electrostatic precipitator. The introduction of the evaporation scrubbing may permit the use of single-stage wet type electrostatic precipitators.

31650 **APTIC NO. 53858**

Anderson, John R. and Charles O. Weiss

METHOD FOR PRECIPITATION OF HEAVY METAL SULFIDES. *(Sybron Corp., Rochester, N. Y.) U. S. Pat. 3,740,331. 3p., June 19, 1973. 5 refs. (Appl. June 23, 1971, 8 claims).*

Heavy metal pollutant ions can be removed from an aqueous solution in a sulfide precipitation process that avoids generation of noxious amounts of hydrogen sulfide and the formation of soluble complexes of sulfide ions. Sulfide ions and heavy metal ions that form a sulfide having a higher equilibrium sulfide ion concentration than the pollutant metal sulfide are added to the aqueous solution to be treated. Since the sulfide of the added heavy metal is more soluble than the sulfide of the pollutant, the heavy metal pollutant ions are precipitated in preference to the added metal ions. The added heavy metal ions act as a scavenger for excess sulfide, thereby preventing the formation of noxious amounts of hydrogen sulfide and complex sulfide ions. Co-precipitation of insoluble mixed metal sulfide compounds that leads to lower pollutant concentration in the effluent is, in some cases, promoted by the added heavy metal. Sulfides such as sodium sulfide, sodium hydrosulfide, and hydrogen sulfide are preferred for reasons of availability and economy. Preferred sulfide ion addition quantities will generally be between two to ten times the pollutant ion concentration. This process can be used to treat wastes from electronics and printed circuit manufacturing plants.

31651 **APTIC NO. 53863**

Anderson, William M. and Ronald J. Renko

BAG FILTER ARRANGEMENT. *(Air Preheater Co., Inc., Wellsville, N. Y.) U. S. Pat. 3,739,557. 4p., June 19, 1973. 6 refs. (Appl. Dec. 20, 1971, 5 claims).*

A bag filter apparatus that removes entrained particulates from a carrier gas stream has been designed with a novel flow arrangement which increases the efficiency of the filter bag by eliminating the reentrainment of filtered dust in the gas stream after it has once been removed. The bag filtering units are arranged in longitudinal banks laterally adjacent a horizontal inlet duct carrying a stream of dust-entrained gas. The gas is exhausted upward from an elongate opening in the inlet duct and is turned downward by the underside of a horizontal tube sheet. Quantities of agglomerated dust cake being removed from the filtering units fall downward in the same direction as the circulating inlet gas stream so that the dust is not reentrained in the incoming gas and again deposited on the filter surface. The inlet duct for dust entrained gas is designed to provide a sudden increase in volume enabling the gas to expand, lose velocity, and drop a portion of the heavier particles into a subjacent collection hopper. (Author summary modified)

31652 **APTIC NO. 53645**

Aoi, Katashi

APPARATUS FOR PURIFYING GASES. *(Assignee not given.) U. S. Pat. 3,715,867. 5p., Feb. 13, 1973. 8 refs. (Appl. Nov. 30, 1970, 4 claims).*

An apparatus for purifying stack gases which contain toxic components such as sulfur dioxide and hydrocarbons, commonly found in chemical plant and petroleum refining emissions, optimizes the conditions of temperature for the condensation separation of such components in an adiabatic expansion chamber to greatly increase the efficiency of the operation. The gas separating chamber consists of a box or vessel which has a gas inlet, a gas outlet, and an exhaust tube. An adiabatic expansion chamber for separation and removal of the toxic components is positioned within the gas separating chamber, and a cooling means for reducing the temperature of the gases is located either inside or outside the vessel. The gas condensed by reduction of temperature in the adiabatic expansion chamber converts some of its components into a liquid form which flows down into an exhaust tube connected to the lower part of the vessel and exits via an exhaust tube. Thus, toxic components are converted into a liquid form due to condensation of the gas into droplets. The purified gas is introduced into an exhaust tube provided with a suction blower; this gas may be heated by a heat exchanger to raise the temperature for efficient release.

31653 **APTIC NO. 53663**

Ashburn, Dillion P.

INTERNAL COMBUSTION ENGINE EXHAUST CATALYTIC REACTOR. *(New Products Corp., Ogden, Utah) U. S. Pat. 3,716,334. 5p., Feb. 13, 1973. 12 refs. (Appl. Feb. 10, 1971, 11 claims).*

A catalytic reactor connectible in series with internal combustion engine exhaust ducting has been designed to reduce exhaust pollutants without deficiencies such as excessive complexity, creation of unacceptable back pressure, or failure to remove pollutants to the extent desired. The device consists of a longitudinally elongated tubular case having lengthwise spaced entrance and exit ports; multiple metallic fins extending longitudinally in the case and in closely packed relation to form multiple flow passages for the gas, the passages being spaced apart transversely; and a metal fin surface consisting of a copper catalyst which when contacted by the hot gas reduces the carbon dioxide content and, hence, increases the oxygen content in the gas discharge from the exit port. The device may be used advantageously anywhere to decrease the carbon monoxide, carbon dioxide, and oxides of nitrogen content of the atmosphere. (Author abstract modified)

31654 **APTIC NO. 53873**

Aust, W. D.

THE SUCCESSFUL REDUCTION OF SO2 TO SULFUR ON LARGE SCALE AND THE APPLICATION OF THIS METHOD TO EMISSIONS FROM POWER PLANTS. *(Die erfolgreiche Ruduktion von SO2 zu Schwefel in grosstechnischem Masstab und die Anwendung dieses Verfahrens auf Emissionen von Kraftwerken). Text in German. VGB Kraftwerkstechnik, 53(8):521-525, Aug. 1973.*

A sulfur dioxide reduction process, which was successfully applied in a metallurgical plant for the recovery of sulfur from SO2 emissions, will be combined with the Wellman-Lord-SO2 enrichment process for removal of SO2 from 544,000 cu m/hr of flue gas from a coal-fired 115-MW-steam boiler. The Wellman-Lord-SO2 recovery process uses a sodium sulfite-rich solution for removal of more than 90% of the SO2 from the flue gas. Since a very pure SO2 gas is obtained, the cleaning stage of the SO2 reduction process necessary in the metallurgical plant can be skipped. The SO2 gas with 15% humidity is directly passed to the main reaction stage of the reduction process. Here the SO2 is brought to reaction with methane. The formation of the desired elemental sulfur and of hydrogen sulfide is promoted by the use of a selective catalyst which was developed for this process. The main reaction stage is followed by a two-stage Claus unit where H2S and the residual SO2 react to form elemental sulfur. The pilot plant will go into operation in mid-1974. It is expected that a 91.3% desulfurization will be achieved.

31655 **APTIC NO. 53681**

Balje, Otto Erich, Constant L. Bouchard, James Knowles, Dimitri Kosacheff, Emil A. Pulick, and Armen Topouzian

AUXILIARY POWER UNIT AND REGENERATIVE EXHAUST REACTOR. *(Ford Motor Co., Dearborn, Mich.) U. S. Pat. 3,713,294. 8p., Jan. 30, 1973. 6 refs. (Appl. Aug. 12, 1971, 20 claims).*

An auxiliary power unit has been developed to provide an alternate technique of utilizing the unburned hydrocarbons and carbon monoxide in the exhaust gases of an internal combustion engine typically of the reciprocating or turbine type to produce power for driving vehicle accessories. The housing contains a burner for combusting the exhaust gases to increase the heat content. Combustion products from the burner pass through a regenerator that transfers heat to inducted air for a turbine. The heated air passes through the turbine to produce useful work and then enters the burner to mix with the exhaust gases of the reciprocating engine. An alternator mounted within the housing is driven by the turbine to supply electrical power. An air cycle air conditioning system also is mounted within the housing, and its compressor is driven by the turbine. (Author abstract modified)

31656 **APTIC NO. 53592**

Barba, John J.

SMOKE CONTROL DEVICE. *(Assignee not given.) U. S. Pat. 3,709,171. 7p., Jan. 9, 1973. 4 refs. (Appl. July 6, 1971, 23 claims).*

An afterburner for stationary smoke emitting installations has been designed which is relatively inexpensive to construct and which is capable of yielding economic returns from recovered heat energy. The device consists of a tubular member which defines a combustion chamber having an inlet and outlet for passing exhaust gas therethrough. A heater adjacent the inlet brings the exhaust gas entering the chamber to its combustion temperature. An outer shell is secured about the tubular inner member and defines a water jacket. Means are also provided for flowing cooling water through the jacket to maintain the temperature of the member sufficiently low to prevent damage resulting from the combustion temperature in the chamber. Burner surfaces that come in contact with smoke or cooling water are coated with a material such as synthetic resin polymer and the like, available under the trademark Teflon, which inhibits the adherence of substances such as dust, ash, carbon, and calcium to the burner surfaces. The preferred embodiment contains a conventional blower disposed upstream of the afterburner to assure continuous and uniform smoke flow. A filter room having dry filters and conventional water filter is downstream of the combustion chamber and terminates in an exhaust conduit. An exhaust fan, if required, that is synchronized with the smoke blower to prevent pressure or vacuum build-ups in the afterburner or filter room may be provided for high capacity exhaust discharge.

31657 **APTIC NO. 53742**

Bartel, Mark H. and James O. Helland

WATER SPRAYS REDUCE PARTICULATE EMISSIONS FROM ASPHALT PLANT SCRUBBER STACK. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1973. (Presented at Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-327.)*

The case history of an asphalt plant which was able to update its dust collection equipment to meet modern air pollution control requirements is presented. Since the asphalt plant begins operations prior to the morning rush hour, the residents driving in from the area mountains could easily spot any visible emissions. The plant received numerous complaints directly from the residents and through the State of Idaho Department of Environmental Protection and Health. When faced with a requirement for source test results, the company developed a wet scrubbing system. Experimentation showed that the addition of three Swirl Air nozzles in the wet scrubber stack greatly reduced visible emissions and eliminated complaints. A source test performed by an independent consulting firm indicated that particulate emissions were at 34.4 lbs/hr at a production rate of 103 tons/hr. This is well below the state code of 51.2 lbs/hr at a production rate of 100 tons/hr. The uniform distribution of finely atomized water droplets in the scrubber was probably a major factor in reducing emissions to an acceptable level. (Author abstract modified)

31658 **APTIC NO. 53659**

Bartholomew, Roger F. and Harmon M. Garfinkel

METHOD OF REMOVING SULPHUR DIOXIDE AND NITROGEN DIOXIDE FROM GASES. *(Corning Glass Works, Corning, N. Y.) U. S. Pat. 3,715,187. 4p., Feb. 6, 1973. 8 refs. (Appl. April 14, 1971, 4 claims).*

A one step operation for the efficient and economical removal of both sulfur dioxide and nitrogen dioxide has been developed by passing the gases through an equimolar molten bath of sodium hydroxide and potassium hydroxide. Other more expensive alkali metal hydroxides such as the hydroxides of lithium, cesium, and rubidium can also be employed. The temperature of the molten bath should be as low as possible to be economical, yet high enough for complete removal of SO2 and/or NO2. The maximum temperature of the bath was about 525 C, though the reaction in the melt was very rapid even at a temperature slightly above 170 C. Inasmuch as the rates of reaction are very rapid, the flow of the gas into the melt must be fast enough to prevent the buildup of solid reaction products across the gas entry duct. The maximum flow rate is determined by such factors as excessive turbulence caused in the melt, the carryover of solid reation product into the exit duct due to the excessive turbulence, and incomplete reaction of the gas with the melt.

31659 **APTIC NO. 53833**

Bascunana, Jose L.

DIVIDED COMBUSTION CHAMBER GASOLINE ENGINES - A REVIEW FOR EMISSIONS AND EFFICIENCY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 28p., 1973. 26 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-74.)*

Gasoline engines may be classified according to whether they operate on homogeneous or heterogeneous air fuel mixtures. Those which operate on heterogeneous mixtures are referred to as stratified charge engines; they can be classified into open chamber and divided chamber types based on the configuration of the combustion chamber. The divided chamber stratified engine has discrete and clearly distinguishable main and auxiliary chambers. If the spark ignition engine is modified to avoid the requirement of a nearly stoichiometric mixture and is operated without restricting its air, using techniques to maintain the combustion rate within appropriate limits, its efficiency will increase. The divided chamber stratified engine produces low emissions because emissions resulting from the burning of the charge in both the prechamber and main chamber are very small; although the concentration of carbon monoxide and hydrocarbons formed in the prechamber can be very high, they can be readily oxidized when they are expelled into the main chamber. Characteristic designs of the divided chamber stratified engine include the Broderson divided chamber engine; the Compound Vortex Controlled Combustion engine; and the divided combustion chamber engine of Newhall and El-Messiri. The former offers throttleless operation of the spark ignition engine with very good fuel economy and low emission levels. While the latter two also offer comparatively good fuel economy and low emission levels, the fact that they throttle the air renders them less efficient than the unthrottled engine. The greatest fuel economy and emission reductions are achieved without air throttling and with ignition started late in the cycle, around top dead center, and combustion developed as rapidly as possible.

31660 **APTIC NO. 53671**

Benson, Harvey S., Jr.

PROCESS FOR SEPARATING PARTICLES FROM AEROSOLS. *(Envirco Corp., San Antonio, Tex.) U. S. Pat. 3,724,181. 6p., April 3, 1973. 1 ref. (Appl. June 11, 1971, 4 claims).*

An apparatus for the removal of liquid or solid particles from an aerosol flowing through a conduit is presented. A feature of the method and means for this invention is the provision of a deflector baffle member arranged to divert the flow of the gaseous stream of the aerosol from a wall of the conduit and to cause the stream to pass over a lip of the deflector member by which an area of turbulence is formed downstream from the deflector member, and also a passage provided through the wall of the conduit adjacent to the lip and downstream from it. Highly efficient particle separation is achieved by the formation of such a turbulent area, or vortex, behind the lip in which particles are momentarily trapped and then caused to move through the passage into a collection chamber. The apparatus may be used for the separation of various dusts, powders, and mists; separation of particles is continuous. (Author abstract modified)

31661 **APTIC NO. 53644**

Biasi, Charles P.

APPARATUS FOR POLLUTION CONTROL OF FURNACE GASES. *(Assignee not given.) U. S. Pat. 3,715,868. 6p., Feb. 13, 1973. 4 refs. (Appl. Nov. 23, 1970, 10 claims).*

A device for removing particulates and reactive vapors from furnace gases has been developed which utilizes a bed of particulate filter material including a means for removing and replenishing that portion of the filter bed which becomes fouled most quickly. A flow velocity reduction chamber separates particles above a predetermined size, and a particulate filter material removes smaller particles from the exhaust stream. The filter material may be of any suitable type such as sand and has a predetermined angle of repose for removal purposes. The removing means comprise a gate for periodically removing part of the sand from adjacent the sides of the chamber and a conveyor for transporting the sand to a treatment facility. The flow area of the chamber substantially exceeds that of the gas introducing means so that the flow velocity in the chamber is less than that in the introducing means. Additionally, crushed limestone or dolomite may be injected into the chamber to react with sulfur dioxide-containing gases; alternatively a reactive material may be disbursed into the sand.

31662 **APTIC NO. 53765**

Blakeslee, C. E.

NOX EMISSION CONTROL FOR UTILITY BOILERS. *Preprint, Instrument Society of America, 3p., 1973. (Presented at the Power Instrumentation Symposium, 16th, Chicago, Ill., May 23-25, 1973.)*

The effect of controlling emissions of nitrogen oxides on the construction of utility boilers is discussed. The Environmental Protection Agency standards are being met in new unit designs by applying a combination of methods to modify the combustion process by either reducing the combustion temperature or the oxygen concentration in the initial flame zone. A tangential firing is utilized which is a proven firing system for low NOx production by virtue of the slow mixing of fuel and air and internal furnace gas recirculation into the flame zone. Gas and oil fired designs incorporate overfire air ports located 5-8 ft above the upper level of the fuel admission nozzles designed to admit approximately 15% of the total combustion air. Coal fire designs include overfire air compartments as extensions of the windboxes to provide for admission of 15% air as overfire air. The size of some steam generators and furnaces will be increased. Potential problems include furnace slagging, furnace wall corrosion, and increased emissions of other pollutants as carbon monoxide, hydrocarbons, and solid combustible material.

31663 **APTIC NO. 53615**

Bress, Dellason F.

CONTROL OF ENVIRONMENTAL POLLUTION IN TALL OIL FRACTIONATION. *(Foster Wheeler Corp., Livingston, N. J.) U. S. Pat. 3,709,793. 3p., Jan. 9, 1973. 2 refs. (Appl. July 10, 1969, 7 claims).*

A system for fractionating tall oil with little or no environmental pollution has been accomplished by treating and recycling the water purge and revaporizing it for reutilization as stripping steam such that the waste liquid normally resulting from the condensation of stripping steam is eliminated. A stream of stripping steam plus contaminants from a fractionation tower lead to a condenser which may be of the barometric type. Foul water from the condenser flows to a hot well and is circulated by a pump to a cooler where it is cooled from return to the condenser. Noncondensable gases from the hot well are preferably disposed of by incineration and emitted to the atmosphere through an elevated stack to eliminate any odor. Noncondensable gases coming from the condenser are compressed in a multi-staging steam evaporator, and the condensates lead to a hot well which overflows to a sewer or other water system. A portion of the circulating water equal to the amount of stripping steam condensed in the condenser is purged. The liquid then flows to a decanter which is suitably baffled to separate the organic from the water phase. The organic phase may be added to low-grade fractions produced or it may be burned. The water phase passes to an odor stripper and then to a surge tank having a floating suction drain which is used to remove any remaining organic matter. Subsequently, the water passes to a pump which forces it to an activated carbon treated vessel for enhancement of water quality. The water is then vaporized and used for stripping steam in the fractionation process.

31664 **APTIC NO. 53648**

Brink, David L. and Jerome F. Thomas

POLLUTANT-FREE PROCESS FOR PRODUCING A CLEAN BURNING FUEL GAS FROM ORGANIC-CONTAINING WASTE MATERIALS. *(The Regents of the University of California, Berkeley, Calif.) U. S. Pat. 3,718,446. 6p., Feb. 27, 1973. 13 refs. (Appl. Feb. 18, 1970, 7 claims).*

A process involving the high temperature distillation and pyrolysis of an organic material such as kraft black liquor, formed during conventional chemical wood pulping, has been designed to break down the material to noncombustible solids and to a stable gaseous clean burning fuel. The process involves introduction of the malodorous-containing gaseous emissions as a source of oxygen for attaining the temperature necessary for the pyrolysis of the organic material but insufficient for effecting stoichiometric (complete) combustion. A suitable temperature range at which recombination reactions are substantially precluded and a stable gaseous end product formed is 800 to 1200 C over a time interval of 1 to 30 sec. Maximum effective heating can be achieved by initiating a reductive pyrolysis of the material in a first zone in which indirect heat is employed and then feeding the material to a second pyrolysis and destructive distillation zone in which the simple stable clean gaseous end product is formed by cracking.

31665 **APTIC NO. 53673**

Burbach, Henry Edward

METHOD AND APPARATUS USEFUL IN COMBUSTION GAS PURIFICATION. *(Combustion Engineering, Inc., Windsor, Conn.) U. S. Pat. 3,726,239. 4p., April 10, 1973. 3 refs. (Appl. Dec. 29, 1971, 8 claims).*

A gas purification apparatus including a wet scrubber having a marble bed for cleaning flue gases of their sulfurous and particulate impurities has been designed such that means are provided for controllably recirculating part of the gas through the scrubber. The improved organization enables the gas flow through the scrubber bed to be substantially constant over the full range of steam generator operation, thereby permitting the activity of the filter bed to be maintained at its most effective level. The device consists of a fuel burning system for the combustion of gases, a wet scrubber arranged to operate effectively when the flow of gas is above a predetermined minimum, a means for conducting the combustion gases to the wet scrubber, a means for conducting the processed gas to the atmosphere, and a means for diverting a portion of the processed gas for recirculation through the wet scrubber when the flow of combustion gas into the scrubber falls below a predetermined value.

31666 **APTIC NO. 53830**

Carlson, R. R., T. A. Huls, S. G. Kuhrtz, and G. M. Wilson

EFFECTIVENESS OF SHORT EMISSION INSPECTION TESTS IN REDUCING EMISSIONS THROUGH MAINTENANCE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1973. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-80.)*

The emission reduction, cost, and cost effectiveness of mandatory periodic Vehicle Emission Inspection and Maintenance (PVEIM) were studied using 300 privately owned 1957 to 1971 model year vehicles in Anaheim, California and Detroit, Michigan. One-half of each vehicle fleet was inspected and maintained using the Idle PVEIM procedure, with the other half being handled according to the Key Mode PVEIM procedure. Fleet emission reductions of 24% for hydrocarbons and 19% for carbon monoxide were obtained using idle PVEIM, while reductions of 35% for HC and 29% for CO were obtained using Key Mode PVEIM. These reductions resulted from initial maintenance actions on approximately 50% of the vehicle fleet and do not account for possible degradation. Oxides of nitrogen emissions were not significantly affected by either procedure. Key Mode provided statistically better emission reductions of HC and CO than Idle on uncontrolled vehicles. Key Mode and Idle provided statistically equal emission reductions for HC and CO in vehicles equipped with exhaust emission controls. The average Idle repair costs were $24.51 per serviced vehicle, and the average Key Mode repair costs were $25.42 per serviced vehicle. Approximately 5% of the inspected vehicles required ring and valve repair costing more than $100. These vehicles contributed 15% of the total HC and 8% of the total CO emissions. Approximately 82% of the failed Idle and 63% of the failed Key Mode vehicles failed only because of idle mixture and timing adjustment. Ignition system repair was required on only 3% of the vehicles. Key Mode data directed carburetor repair in order to pass 27% of the failed vehicles, while the Idle data directed carburetor repair in order to pass 5% of the failed vehicles. Key Mode was more cost effective in reducing emissions than Idle. (Author abstract modified)

31667 **APTIC NO. 53580**

Cettin, Edward J., Jimmy P. Pappas, and Sam E. Lager

ANTI-POLLUTION SYSTEM FOR INTERNAL COMBUSTION ENGINES. *(Thermo-Chem Systems, Inc., Wilmington, Del.) U. S. Pat. 3,709,203. 7p., Jan. 9, 1973. 8 refs. (Appl. July 16, 1971, 15 claims).*

A system is presented for use with any internal combustion engine to eliminate carbon monoxide, hydrocarbons, and nitrogen oxides from the engine exhaust. The system is substantially closed, eliminating the use of ambient air for combustion of the fuel, and in place thereof utilizes oxygen generated by the thermal decomposition of an alkali metal perchlorate salt in the presence of a catalyst. Heat for the generation of oxygen is provided by the exhaust from the engine manifold. The exhaust and oxygen are then mixed in proportions of 4:1, and the mixture blended with the fuel in the carburetor for combustion in the engine. (Author abstract)

31668 **APTIC NO. 53632**

Chang, C. M.

NONLINEAR SOLUTION TO THE TWO-PHASE SPACE-CHARGE FLOW PROBLEM IN A GRID-TYPE ELECTROSTATIC PRECIPITATOR. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 20p., 1973. 12 refs. (Presented at Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-294.)*

With regard to electrostatic precipitators, an analytical tool was developed which facilitates the investigation of the precipitation fundamentals, permits the prediction of precipitator performance, and is practically useful for the further development of partical control technology. Based on a plasma kinetic formulation, a new nonlinear solution has been derived for the one dimensional, space-charge flow problem in a grid-type electrostatic precipitator. Boltzmann and Poisson's equations form the basis for this analysis. The interactions between the charged dust particles and the neutral air molecules are described by expressions representing a weighted combination of the Stokes drag force formula and the BGK collision model. Methods used include series truncation, full range moments, transformation, numerical integration, and interation. The general characteristic features of this nonlinear solution are illustrated by means of a numerical example. All flow properties described by this solution appear to be reasonably meaningful. The gas-solid interaction mechanism is also modeled and discussed. Utilizing this model, the present nonlinear solution represents a useful analytical tool which should find application in the areas of design optimization. (Author abstract modified)

31669 **APTIC NO. 53605**

Clapham, Thomas Miller

BONDED ACTIVATED CARBON AIR FILTER. *(Calgon Corp., Pittsburgh, Pa.) U. S. Pat. 3,721,072. 5p., March 20, 1973. 5 refs. (Appl. July 13, 1970, 8 claims).*

An improved bonded activated carbon filter for removing odors, hydrocarbons, and other contaminants from the air has been designed. The filter does not form dust or show a loss of capacity, is easy to handle, and shows a minimum pressure drop without having to by-pass air. It also has a maximum adsorption removal efficiency for a given flow rate and allowable pressure drop. The filter design incorporates activated carbon granules bonded together into a monolithic extended surface shape in the form of a wave. The wavelength of the surface depends on factors such as the ultimate size of the filter, the thickness of the carbon layer, the size of the carbon granules, the allowed pressure drop, the necessary flow rate, and the amount of carbon necessary to remove the undesirable contaminants. A wavelength of at least 3/8 inch is desirable for most applications. The thickness of the bonded carbon can also be varied, and for most applications a minimum of 1/4 inch is desirable. The surface area should normally run between 600-1400 sq m/g.

31670 ***APTIC NO. 53665***

Colley, Donald G., Raymond M. Leliaert, and Clyde A. Snyder

DUST COLLECTOR. (Wheelabrator Frye Inc., New York) U. S. Pat. 3,726,066. 11p., April 10, 1973. 12 refs. (Appl. Dec. 14, 1970, 5 claims).

A new and improved dust collector for the separation of solids from gaseous media has been devised which represents a marked improvement in the jet principle for removal of solids collected on the surfaces of filter elements. The device makes use of continuous filter flow, in which the gas to be filtered is introduced into the filter system in a manner to assist in the settling of solids removed from the filter surface. It also operates at lower levels of pressure drop across the filter surface and with improved operating efficiency. The filter surface is in the form of filter tubes from which the filter cake is removed by a reverse burst of high pressure gas without stopping filter flow. The gaseous medium with suspended solids is baffled for introduction into the filter section so as not to interfere with the disposal of the removed filter cake; it also enhances solids separation. A hopper at the base of an inlet plenum chamber receives the removed solids.

31671 **APTIC NO. 53851**

Cook, Harvey A.

LOW EMISSION INTERNAL COMBUSTION ENGINE AND METHOD OF IMPROVING COMBUSTION. *(TRW Inc., Cleveland, Ohio) U. S. Pat. 3,709,201. 6p., Jan. 9, 1973. 4 refs. (Appl. March 1, 1971, 4 claims).*

A low emission, six-stroke internal combustion engine has been designed to improve the combustion of the air-fuel mixture and hence achieve reduction in undesirable exhaust emissions. The air-fuel mixture is subjected to two additional strokes between the intake of air and fuel into the cylinder and the spark ignition of the engine cycle in order to increase the time for mixing of the fuel and air and to insure that all of the fuel is in vapor form at the time of the spark ignition. Hence, the preferred embodiment of the method is a six-stroke engine having a power stroke, an exhaust stroke, and intake stroke, a fuel preparatory compression stroke, a fuel preparatory expansion stroke, and a compression stroke with the spark ignition. Actuating means for the intake and exhaust valves can be cam operated by a cam shaft; a conventional V-8 engine having overhead cams can be readily modified into a six engine by changing the drive ratio from 1:2 to 1:3 between the overhead cam shafts and the crank shaft. It is anticipated that the six-stroke engine can also be utilized in a one-cylinder engine, a two cylinder-engine with the cylinders either in line or in opposed relationship, a three-cylinder engine with the cylinders arranged in line, a four-cylinder engine with the cylinders arranged as a V-4 configuration, a six-cylinder engine, a nine-cylinder engine with the cylinders either in line or in a delta configuration, and a 12-cylinder engine with the cylinders in a 90 deg V arrangement.

31672 **APTIC NO. 53920**

Coons, William R., Jr., James H. Colvert, and Gerald V. Nelson

EFFLUENT COOLING IN A HYDROCRACKING AND HYDRODESULFURIZING PROCESS. *(Texaco Inc., New York) U. S. Pat. 3,716,476. 5p., Feb. 13, 1973. 8 refs. (Appl. Dec. 28, 1970, 6 claims).*

A process for reducing the sulfur content of heavy petroleum hydrocarbon oils has been developed in which the catalyst does not require frequent regeneration or replacement and in which the catalyst deactivation rate is low. The residue-containing petroleum hydrocarbon fraction is contacted in the presence of hydrogen (70 90 vol%) with a supported catalyst consisting of a member of the Group VI metals, Group VIII metals, their compounds, and mixtures thereof under hydrocracking conditions comprising a temperature between 750 and 950 F, a pressure between 500 and 5000 psig, a space velocity of 0.1 to 10, and a hydrogen rate between about 1000 and 30,000 SCFB. The effluent is cooled and passed into contact with a supported catalyst consisting of a member selected from the Group VI metals, Group VIII metals, their compounds, and mixtures thereof under desulfurization conditions comprising a temperature between 600 to 850 F and pressure, space velocity, and hydrogen rate conditions identical to those for the initial contact. The fraction of reduced sulfur content is then recovered from the effluent.

31673 **APTIC NO. 53585**

Couchman, James C. and George W. Applebay

AIR SAMPLING DEVICE. *(Atomic Energy Commission) U. S. Pat. 3,710,557. 4p., Jan. 16, 1973. 4 refs. (Appl. March 17, 1972, 10 claims).*

An air sampler for use in conjunction with moving aircraft has been designed to achieve isokinetic sampling conditions in an expenditious and efficient manner not requiring the employment of a vacuum pump. The device combines a sampling duct containing a particulate filter with a venturi shroud surrounding the duct. A turbulence condition which tends to build up behind filters of relatively large diameter is minimized by providing means for delivering high velocity air to the region directly behind the filter. This may be expeditiously accomplished by positioning several tubes so as to bleed air from the venturi into the outlet portion of the sampling duct. Control jets in the region of the venturi constriction enable the effect of the venturi be varied by the injection of pressurized air or utilization of the siphon pumping action of the venturi.

31674 **APTIC NO. 53589**

Coughlin, Robert W.

PROCESS AND DEVICE FOR PURIFYING AIR. *(Assignee not given.) U. S. Pat. 3,710,548. 6p., Jan. 16, 1973. 6 refs. (Appl Oct. 19, 1970, 10 claims).*

An air purifying device which makes use of both a liquid and a catalyst has been designed to remove from ambient air both gaseous and particulate matter pollutants and to simultaneously concentrate said pollutants into a small volume of liquid that can be easily discarded after they have reached a suitable concentration level. The present invention differs from the prior art in the following ways: gaseous pollutants are absorbed into the liquid before they are oxidized; the oxidation catalyst may be either homogeneous (i.e., dissolved in the liquid) or heterogeneous (i.e., a solid); and, when the catalyst is activated carbon, it is not necessary to impregnate the active carbon with another catalytically active substance. The process involves contacting the polluted gas mixture with a liquid such that impurities are washed from the gas and absorbed, together with oxygen, into the liquid for oxidation to more soluble chemical forms via the assistance of a catalyst in the system. Examples are provided for sulfur dioxide removal wherein suitable homogeneous and heterogeneous catalysts and suitable packing materials are suggested.

31675 **APTIC NO. 53917**

Culpepper, George O., Jr.

METHOD AND APPARATUS FOR CLEANING SOLIDS FOR POLLUTION FREE DISPOSAL. *(Assignee not given.) U. S. Pat. 3,734,774. 6p., May 22, 1973. 11 refs. (Appl. Jan. 29, 1971, 3 claims).*

A safe and inexpensive method and apparatus for removing a coating of hydrocarbon or oil from the surface of a solid particulate material such as sand has been developed. The polluted sand is introduced under pressure into a pressurized firing chamber. Prior to the introduction of the sand into the firing chamber, a fuel-air mixture is introduced into the firing chamber and ignited. The air-fuel mixture is maintained at such a ratio that the fuel is always completely burned to eliminate any possible hazard at the downstream end of the unit. Controls are provided to maintain a certain predetermined temperature within the firing chamber and to shut the unit down when lack of combustion or incorrect temperature is indicated. Immediately downstream of the firing chamber is a restriction which points the flame and confines it to the firing zone. The spent, burned gases and solids are introduced into a vortex tank at the end of the unit and are then sent to the atmosphere through a flash arrester; solids are discharged downwardly into the ocean or on land.

31676 **APTIC NO. 53608**

Dalrymple, Jerry C.

DUST COLLECTOR SHROUD. *(Assignee not given.) U. S. Pat. 3,707,998. 5p., Jan. 2, 1973. 4 refs. (Appl. June 28, 1971, 7 claims).*

A collapsible dust collector shroud has been designed to prevent the escape of cement dust or other dust into the atmosphere when filling a transit mix concrete truck from a batch plant loading station. The shroud is made of accordion-pleated material, is movable about a pivot to encompass and loosely enclose the exposed portion of the truck filler member, and can be raised to provide clearance for positioning the truck and its filler member relative to the discharge chute of the batch plant. A suction tube extends into the interior of the shroud for removing dust generated during gravity discharge of materials from the discharge chute into the filler member. The shroud may contain small apertures for air entry to prevent buildup of dust on the inner walls of the shroud. (Author abstract modified)

31677 **APTIC NO. 53887**

De Palma, Ted V. and Martin W. Perga

METHOD AND MEANS FOR CATALYTICALLY TREATING ENGINE EXHAUST GASES. *(Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,729,936. 6p., May 1, 1973. 3 refs. (Appl. May 24, 1971, 5 claims).*

A method for catalytically treating engine exhaust gases allows for the use of a single, relatively small converter to both reduce the nitrogen oxide gases and to oxidize the carbon monoxide and hydrocarbons present. The internal combustion engine is operated with a rich air/fuel ratio (excess fuel) to maintain the content of the untreated exhaust gases generally low in oxygen and high in carbon monoxide. The untreated gases are then passed through a single bed of catalyst material having an upstream reducing zone and a downstream oxidation zone. Air is introduced into the oxidation zone of the catalyst bed in a direction transverse to the direction of exhaust flow, and the nitrogen oxides are reduced by the carbon monoxide in the upstream zone of the bed. Air is admixed with exhaust gases to oxidize the hydrocarbons and carbon monoxide in the downstream zone of the catalyst bed. Particularly suitable catalytic materials are copper oxide or copper oxide promoted with other metal oxides including iron, cobalt, chromium, magnesium, cerium, vanadium, and nickel oxides supported on an alumina carrier material.

31678 **APTIC NO. 53621**

Deschamps, Andre, Sigismond Franckowiak, and Philippe Renault

PROCESS FOR REMOVING TRACES OF HYDROGEN SULFIDE AND MERCAPTANS FROM GASES. *(Inst. Francais Du Petrole Des Carburants Et Lubrificants, Paris (France)) U. S. Pat. 3,716,620. 4p., Feb. 13, 1973. 3 refs. (Appl. Oct. 27, 1970, 16 claims).*

A process for practically complete removal of traces of hydrogen sulfide and mercaptans from gases has achieved lower iodine and hydroiodic acid losses and has resulted in easy recovery of sulfur from the oxidation of H_2S. The process consists of oxidizing hydrogen sulfide to sulfur and mercaptans to disulfides by means of iodine dissolved in a particular organic solvent. The iodine solution may be regenerated by means of an appropriate oxidant. The use of a small amount of amine in the process results in a considerably increased reaction velocity. The preferred amines are the alkanolamines, e.g., diethanolamine or N-methyl-diethanolamine. The amine concentration may vary broadly from 0.05 to 10% by weight with respect to the reaction liquid phase. The iodine concentration is preferably in the range of 0.005 to 1.0 mol/l. Water in small amounts increases the reaction velocity. The organic solvent may be selected from the following: sulfoxides; glycols, ethers, and esters thereof; aromatic hydrocarbons; aromatic ethers; amides; pyrrolidones; piperidones; sulfones; phosphoric acid esters of 6-30 carbon atoms; carboxylic acid esters of 3-24 carbon atoms of monohydric alcohols, and mixtures thereof.

31679 **APTIC NO. 53612**

Domnitch, Irving

INCINERATOR EMISSIONS REDUCTION SYSTEM. *(Assignee not given.) U. S. Pat. 3,710,555. 4p., Jan. 16, 1973. 8 refs. (Appl. Aug. 21, 1970, 1 claim).*

A novel scrubber for reducing incinerator emissions operates under automatic control, is substantially self-cleaning, and has few moving parts to provide a high quality, yet simple and reliable structure. The device consists of a barrier within the exiting flue for constraining the emitted particulates to flow in a tortuous path. An automatic smoke detector is provided in the neighborhood of the barrier for selectively energizing a water spraying device to emit a fine water spray upon a porous barrier, only in the presence of an emission. The emission, in passing through the porous barrier, is thoroughly washed, causing particulates to be removed via the combined cooperation of the porous material and the water film upon one surface of the barrier. The removed particulate material is carried with the water into a collection device where it may be simply and easily removed. The water spray serves the further function of continuously washing the porous barrier thus providing a substantially self-cleaning system.

31680 **APTIC NO. 53787**

Dorfman, Ye. Ya. and A. M. Kunin

SODIUM FORMIATE SYNTHESIS FROM AMMONIA-PRODUCTION-RESULTING EMISSIONS. *(Sintez formiata natriya iz otkhodyashchikh gazov proizvodstva ammiaka). Text in Russian. Khim. Prom. (Moscow), no. 6:425-426, 1973.*

The conditions of the synthesis of sodium formiate by the reaction of the carbon monoxide fraction generated by the ammonia production process with sodium hydroxide in ethanol were studied in laboratory and pilot tests. The CO fraction with a CO content of 25-30% was compressed to 100-120 kg/sq cm for subsequent reaction with sodium hydroxide solution in ethanol. Linear relationship between the sodium formiate output and the CO partial pressure, and increase in the sodium formiate output with increasing temperature were observed. The sodium hydroxide concentration had no effect on the output. The optimum conditions for the sodium formiate synthesis, determined in pilot tests, were 105 C, 20 atm, a sodium hydroxide concentration of 100 g/l, a CO:NaOH molar ratio of 5:1, and a contact time of 19.1 sec. Under such conditions, a CO conversion rate of 44% and a sodium formiate output of 99% were measured. The waste gas methanol concentration was 2.8-5 g/cu m.

31681 **APTIC NO. 53674**

Dortenzo, Alexander T.

ANTI-POLLUTION DEVICE FOR A METALLURGICAL VESSEL. *(Pennsylvania Engineering Corp., Pittsburgh, Pa.) U. S. Pat. 3,724,827. 7p., April 3, 1973. 2 refs. (Appl. Oct. 20, 1971, 9 claims).*

An improved pollution control apparatus for steel conversion and other metallurgical vessels has been designed to inhibit the discharge of pollutants from metallurgical vessels when the latter are disengaged from their smoke hoods, are being charged, teemed, deslagged, or when their contents are being sampled. Typical vessels to which the invention is applicable are argon oxygen converters and top and bottom-blown basic oxygen converters. The device consists of a converter vessel having an open upper end and an enclosure substantially surrounding it. The enclosure has at least one access opening to permit hot metal or scrap to be charged into the vessel and is associated with a system for exhausting the space within the enclosure around the vessel. Atmospheric air is prevented from entering the enclosure and from displacing smoke and gases to the atmosphere by devices which produce air curtains in the vicinity of certain necessary enclosure openings. (Author summary modified)

31682 **APTIC NO. 53591**

Duty, Cermillus H., Steven J. Stuit, and Jack B. Stuit

DEVICE AND METHOD FOR REMOVING POLLUTANTS FROM STACK GASES. *(Assignee not given.) U. S. Pat. 3,708,958. 9p., Jan. 9, 1973 2 refs. (Appl. July 19, 1971, 15 claims).*

An apparatus for the efficient, reliable, and economical removal of smoke particles and water soluble combustion gases from the stack gases of roofing tar heaters, supermarket incinerators, and the like, as well as from the stack gases of larger combustion devices has been designed so that pollutants can be scrubbed with a combination of steam and water and activated adsorbent in a manner that prevents pollutants from forming a gummy mass which interferes with recycling of the collected steam condensate and water spray. Unlike baffle units designed to overcome the recycling problem, the present unit does not hinder the draft through the unit to an undesirable degree. Stack gas is led upwardly through a body shell containing baffle elements and associated peripheral skirts. A steam spray and a water spray are each directed on respective baffle elements and the zone of gas flow. The baffle elements, except the lowermost, and the deflector skirts, have a foraminous shell which is filled with an activated adsorbent, preferably a high surface area material such as anthracite activated by exposure to steam above a temperature of 100 C or gamma alumina. Smoke particles and water soluble combustion gases are efficiently removed from the stack gas and collected solids are brought into a form which is readily carried away with collected steam condensate and water for filtering and recycling to the water sprays.

31683 **APTIC NO. 53897**

Fornoff, L. L., J. J. Collins, and W. C. Miller

THE COULTON PURASIVE S UNIT GOES ON-STREAM. *Preprint, Air Pollution Control Assoc Pittsburgh, Pa., 11p., 1973. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-331.)*

PuraSiv S is a proprietary molecular sieve adsorption process for the removal and recovery of sulfur dioxide from sulfuric acid plant tail gas. The first commercial unit, installed on Coulton Chemical Company's sludge acid plant, has been reducing the SO2 tail gas emission level to less than 25 ppm (equivalent to 0.4 lbs SO2 per ton of acid produced) since going on-stream Feb. 4, 1973. The operation of the unit is fully automatic, requiring only an occasional check by the acid plant operator. PuraSiv S is a dry process with no by-product disposal; the SO2 is recovered and recycled back to the base acid plant for an addition 2 to 3% H2SO4 production. The total treating costs for an add-on PuraSiv S unit range from $1.25 to $2.25 per ton of acid, depending upon the acid plant size and the concentration of SO2 in the tail gas leaving the absorber tower. Treating costs for a new plant will be about 20% less if the unit is included in the initial design of the acid plant facility. The standard PuraSiv S design can process a feed containing 3500 ppm/v SO2 and can be extended to higher design feeds by including additional molecular sieves in the vessels. This allows for a richer SO2 gas strength to the converter in the base acid plant. For a new plant, the size of the acid plant can be reduced by handling a stronger gas. In an existing plant, it is possible to increase productin by increasing the SO2 strength to the converter. (Author summary modified)

31684 **APTIC NO. 53919**

Fox, Homer M.

METHOD AND APPARATUS FOR REDUCING ENGINE EXHAUST POLLUTANTS. *(Phillips Petroleum Co.) U. S. Pat. 3,717,129. 6p., Feb. 20, 1973. 7 refs. (Appl. Sept 28, 1970, 10 claims).*

A method and apparatus for reducing the pollutants from the exhaust of an internal combustion engine and for forming a higher energy fuel is presented. Water and a liquid hydrocarbon fuel are passed through a catalytic bed which contains a suitable steam reforming catalyst, preferably formed of nickel or cobalt; a particularly preferred catalyst is a calcium aluminate-nickel composition, containing about 20 wt% nickel and modified by incorporation of about 5 wt% of a barium salt such as barium acetate. The temperature of the fuel in contact with the catalytic bed is then increased by indirect heat exchange with exhaust gases from the engine. THe fuel is steam reformed, and the reformed fuel is passed to the engine for operation with reduced pollutants in the exhaust. The temperature of the exhaust gases passing through the fuel regenerator adjacent the catalytic bed should be at least 950 F before the fuel and water is injected into the bed. The temperature necessary to sufficiently reform fuel in the bed depends upon the type of catalyst, type of fuel, and the volumes of materials injected into the bed.

31685 **APTIC NO. 53849**

Franke, Hermann, Heinz Limmer, and Wilhelm Thomas

THE EFFORTS OF THE VEB PCK SCHWEDT FOR PRODUCTION OF LOW-POLLUTING CARBURETOR FUELS. *(Die Bemuehungen des VEB PCK Schwedt zur Herstellung umweltfreundlicher Vergaserkraftstoffe). Text in German. Chem. Tech. (Berlin), 25(8):463-466, Aug. 1973 16 refs.*

The production of low-polluting fuels by the VEB PCK Schwedt refinery is discussed. The development of spark ignition engines with high power per unit displacement has gradually raised the demand on the quality of fuels, primarily on the knocking properties. The most important quality parameters for automobile fuels are indicated by the standards valid in Soviet Union, GDR, Poland, Czechoslovakia, and the Federal Republic of Germany. While there is hardly any difference between the standards concerning octane number, density, boiling properties, and sulfur concentration of low-octane and high-octane fuels of these countries, the maximum allowable lead concentration differs widely. In the GDR 0.422 g Pb/l high-octane or low-octane fuel are allowed. The demand for fuels with high knocking resistance clashes with the demand for reduction or elimination of the lead concentration. In the GDR it will be feasible to reduce the tetraethyl lead concentration to 0.02% by volume in the years after 1975 by limiting the production quantities of fuels with a research octane number higher than 90. The production of lead-free gasolines until the early 80s will be feasible only if octane numbers 84 to 86 and less are accepted. For achieving uniform and complete combustion processes, a decrease of the boiling end point of gasolines is desirable. More homogeneous mixtures are obtained which permit a more complete combustion with less emission of carbon monoxide and hydrocarbons. For an adjustment of the carburetor to produce fuel-to-air-mixtures which yield minimum emissions of unburned fractions, a uniform density of the various gasolines (0.010 is the international density unit) is required.

31686 **APTIC NO. 53918**

Fukazawa Shoichi, Tadashi Murayama, and Yasuhiro Fujiwara

AN EXPERIMENTAL STUDY ON EXHAUST SMOKE IN DIESEL ENGINE. *(Dizeru enjin no haiki toen ni kansuru kenkyu). Text in Japanese. Jidosha Gijutsukai Ronbunshu (Proc. Soc. Automotive Engrs.), no. 5:40-47, June 1973. 5 refs.*

The effects of operating parameters and combustion chamber types on the smoke concentration in a diesel engine exhaust were studied. Carbon particles in the exhaust were observed by electronic microsope. Immediately after the combustion room, the carbon particles are extremely small and spherical, but connected in chains or clusters. While these particles pass through the exhaust pipe, they grow into larger particles, and when they come out of the exhaust pipe, the particles are several times larger. The effects of fuel injection on the concentration of exhaust gas and the mean carbon particle size were examined. Regardless the type of fuel, when injection time was abvanced, the smoke density drastically increased. The mean carbon particle size was also larger. However, if injection time was greatly delayed, there was not much improvement in smoke concentration. This is because the amount of fuel increases and oil particles cool the flame and prevent carbon particle combustion. When fuel injection is greatly delayed, smoke increases drastically. In order to decrease exhaust smoke, the air rate in the combustion room must be improved and factors obstructing the combustion of carbon particles must be eliminated. Fuel additives can decrease smoke without damaging engine performance, but there is no improvement in power output. But light fuel (gasoline) can operate engine effectively without additives and can decrease exhaust smoke drastically; the power output also can increase greatly.

31687 **APTIC NO. 53588**

Garrone, Franco

APPARATUS FOR SEPARATING SOLID PARTICLES SUSPENDED IN A GASEOUS STREAM. *(AMF Inc.) U. S. Pat. 3,710,561. 5p., Jan. 16, 1973. 5 refs. (Appl. Dec. 4, 1970, 1 claim).*

A device for separating solid particles held in suspension in a dust-laden stream of air has been designed to utilize centrifugal force without introducing considerable load loss common to similar type devices. The dust separator includes a duct that can be rectangular in cross section and curved to provide a semi-circular path for gas that flows through the duct. The width of the duct is relatively wide when compared to its depth; and when arranged in a vertical plane, the upper end of the rectangular duct is joined to a cylindrical duct which carries the dust-laden air. The cross-sectional area of the cylindrical duct can be substantially equal to the cross-sectional area of the rectangular duct. The bottom end of the rectangular duct is joined to a discharge duct which can be rectangular in section and diverge in the direction of gas flow. The diverging discharge duct is coupled to a wedge-shapped blade which is hinged at one end and adjustable to form a louver which extends into the duct through the wall forming the outside curve. The suspended solid particles separated from the gas stream by centrifugal force form a layer of dust adjacent the surface of the wall of the duct forming the outside curve and are subsequently deflected downward by the blade into a collecting chamber positioned beneath the blade. The cleaned air passes over the top of the blade and is conveyed towards the discharge duct.

31688 **APTIC NO. 53682**

Gaylord, John A.

DEVICE FOR CLEARING IMPURITIES FROM THE ATMOSPHERE. *(Assignee not given.) U. S. Pat. 3,722,183. 7p., March 27, 1973. 8 refs. (Appl. Feb. 16, 1971, 4 claims).*

An improvement in electrostatic air-cleaning devices permits facile adjustment of the spacing between the electrodes in accordance with atmospheric conditions and enables arrangement of the size and number of electrodes in a manner necessary for the purification of large masses of air. The main objective is to provide a device whereby air could be treated and purified in sufficiently large masses to free the atmosphere of smog. The apparatus contains oppositely charged electrode cones or electrode cylinders which are adjustably supported so that one cone or cylinder is within the other cone or cylinder with a space separating the two. Air currents attracted to and flowing through the electrostatic field will have particles of impurity which will acquire the charge of one of the electrodes and will be repelled to be collected on the other electrode cone or cylinder. The cones are made of fiberglass, and the adjacent faces of the cones are coated with fiberglass wool. (Author abstract modified)

31689 **APTIC NO. 53658**

Gehri, Dennis C.

A CATALYTIC TREATMENT OF EXHAUST GASES. *(North American Rockwell Corp.) U. S. Pat. 3,718,733. 10p., Feb. 27, 1973. 7 refs. (Appl. Feb. 20, 1970, 14 claims).*

A catalytic method of treating a hot, carbon dioxide-containing automotive exhaust gas resulting from the combustion of a leaded gasoline to remove impurities such as nitrogen oxides, carbon monoxide, and lead halides has been developed to reduce such problems as replacement of catalyst, cost, complexity of structure, and weight penalties associated with similar devices. The hot automotive exhaust gas is contacted in a first stage with a molten salt containing as an active absorbent a ternary mixture of the carbonates of lithium, sodium, and potassium to remove at least a portion of the lead halides. The exhaust is then passed through an active demister metal mesh to further react lead halide with the active absorbent salt while de-entraining the molten salt from the gas. The dry lead-free gas is then directed to a second stage containing a lead sensitive dry catalyst for effecting a reaction between the CO and the NOx to form nitrogen and carbon dioxide. A metal wire mesh comprised of copper-containing alloys, particularly the Monel and cupronickel alloys, most efficiently promoted the final reaction. The Monel alloys having a copper content from 25-35 wt%, a nickel content between 60-70 wt%, and optionally containing amounts of iron up to 6.5% and lesser amounts of manganese, silicon, and carbon are particularly preferred and provide substantially complete removal of NOx at residence times of 0.2 sec and less.

31690 **APTIC NO. 53678**

Giammarco, Guiseppe and Paolo Giammarco

PROCESS FOR ELIMINATING CO2 AND/OR H2S FROM GASEOUS MIXTURES. *(Vetrocoke Cokapuania S.p.A., Venezia Porto Marghera (Italy) and Guiseppe Giammarco, Venice (Italy)) U. S. Pat. 3,725,529. 19p., April 3, 1973. 8 refs. (Appl. July 14, 1969, 6 claims).*

A process for eliminating carbon dioxide and/or hydrogen sulfide from a gaseous mixture is presented which utilizes an absorbent aqueous solution circulated between an absorption phase and a regeneration phase. Gases produced at very high temperature, as for example in steam reforming or shift conversion, are placed in direct, intimate contact with the absorbing solution to provide heat for regeneration purposes rather than supplying the heat to conventional reboilers of regeneration columns as was done in the prior art. The process insures that the heat yielded at the absorption step does not interfere with the chemical absorption of CO2 by subdividing the absorber into two zones, one for the chemical absorption of CO2 and the other for the collection of heat heat from the gas. Hence, the solution is heated to a high temperature so that upon expansion a sufficient quantity of steam for regeneration is evolved. The temperature of the solution at the absorption step is prevented from rising excessively by removing part of the expanded solution from the absorber; the cooled solution is then returned to an intermediate level in the absorber in order to further absorb quantities of CO2 and heat. The solution from the absorber which has been heated by the hot gases is expanded by a gradual progressive flash which is of considerably higher efficiency than the conventional simple instantaneous flashing. (Author abstract modified)

31691 **APTIC NO. 53611**

Gilbertson, John E.

AIR PURIFYING AND DEODORIZING DEVICE FOR AUTOMOBILES. *(Assignee not given.) U. S. Pat. 3,722,182. 4p., March 27, 1973. 23 refs. (Appl. May 14, 1970, 2 claims).*

An air purifying and deodorizing device with air intake and discharge openings in the housing has been designed for positioning on the rear window deck of an automobile. An electronic filtering device is mounted at the air intake opening for removing airborne particles from the air being taken into the device. A ring-shaped filter device is positioned in the housing for further filtering the air as it passes therethrough. A deodorant cup is positioned within the ring-shaped filter and deodorizes the air as the air passes through the device. An electric fan is positioned below the rear deck and is adapted to draw the air through the device and to discharge the same through the discharge opening. A directional vent is located at the discharge opening for directing the discharged air onto the rear window to de-fog the air. An optional purifying and deodorizing device may also be employed which is adapted to supply outside air into the interior of the vehicle and to purify and deodorize it. (Author abstract modified)

31692 **APTIC NO. 53724**

Golibrzuch, Werner

ECONOMY OF WASTE GAS PURIFICATION FACILITIES. *(Wirtschaftlichkeit bei Abluftreinigungsanlagen). Text in German. Melliand Textilber., 54(8):871-874, Aug. 1973. 2 refs.*

Techniques for waste gas purification in textile mills and dye houses are given. Adsorption on activated carbon or absorption in water, catalytic incineration, and thermal incineration are proven economical methods for exhaust gas purification. The universally applied techniques of catalytic and thermal afterburning are of even more interest presently. In both methods the exhaust gas is brought to a specific temperature by preheating with fuels, then organic impurities oxidize and convert into carbon dioxide and water. A reaction temperature of 350-500 C is necessary in the absence of catalysts. Thermal purification works in the range of 600-1000 C. The advantages and disadvantages of the different methods are presented.

31693 **APTIC NO. 53672**

Goutos, George

APPARATUS FOR REMOVING PARTICULATE MATTER FROM A FILTER CHAMBER. *(Assignee not given.) U. S. Pat. 3,726,402. 7p., April 10, 1973. 1 ref. (Appl. July 2, 1971, 20 claims).*

A vented auger device having a hollow interior has been designed to automatically remove particulate matter from a filter chamber in a service-free manner. The auger comprises inlet openings that provide fluid communication between the interior of the filter chamber and the interior of the auger. An outlet provides fluid communication between the hollow interior and the auger outlet from the filter chamber. A reciruclation pump is adapted to withdraw liquid from the auger outlet, causing liquid in the filter chamber to flow into the auger shaft while the particulate matter collects around the outside surface of the shaft. Rotation of tha auger moves the particulates surrounding the auger to a discharge opening in the filter chamber. Control means are provided to intermittently drive the auger and recirculation pump separate times so that the recirculation pump will first draw particulate matter downwardly to the auger; the auger subsequently discharges the particulate matter from the filter chamber. (Author abstract modified)

31694 **APTIC NO. 53609**

Grainger, Lewis M.

ANTI-POLLUTION HEATING SYSTEM. *(Assignee not given.) U. S. Pat. 3,713,433. 5p., Jan. 30, 1973. 5 refs. (Appl. Sept. 21, 1971).*

An antipollution oil burner heating system for hot air, hot water, and steam units has been developed. Operationally, a flame from a gun type oil burner is fed into a cylindrical chamber somewhat larger in diameter than the outlet of the oil burner, and the air feeding the flame is given a swirling motion by a set of stationary vanes in the air passage. The chamber curves inwardly to a reduced diameter outlet to momentarily retard the flow and cause all of the oil to become ignited. The products of combustion then pass into a large chamber which has perforated side walls for air inflow, thus providing sufficient oxygen to achieve complete combustion. A surrounding air chamber conducts air to the heated walls with some of the air flowing into the chamber and the remainder flowing through the air system of a home or other space to be heated. A lip underlies the jet of the oil burner to receive any oil dripping as the burner is inactivated. The oil is directed into the combustion chamber where it is instantaneously atomized by the heated walls. (Author abstract modified)

31695 **APTIC NO. 53577**

Greipel, Frank J.

CATALYTIC MUFFLER. *(Assignee not given.) U. S. Pat. 3,713,783. 3p., Jan. 30, 1973. 7 refs. (Appl Aug. 9, 1971, 8 claims).*

A catalytic muffler has been designed for attachment to the exhaust manifold of an automotive engine or similar internal combustion engine for the purpose of reducing objectionable constituents such as unburned hydrocarbons and carbon monoxide. Exhaust gases, after entry into the muffler housing, are distributed for passage through a plurality of longitudinal conduits, each of which contains a series of coils of stainless steel wire through which the exhaust gases must pass. An air conduit, which extends longitudinally through the muffler, receives atmospheric air from the exterior of the muffler housing. This air is heated in its passage through the air conduit and is mixed with the gases passed through the exhaust conduits prior to discharge from the housing. The air conduit is preferably provided with interior baffles to define a serpentine flow path through the conduit, thus prolonging the residence of the air within the conduit in order to facilitate heating of the air. (Author abstract modified)

31696 **APTIC NO. 53587**

Gustavsson, Karl Axel Goran

APPARATUS FOR CLEANING SULPHUR DIOXIDE-CONTAINING FLUE GASES. *(Aktiebalaget Bahco Ventilation, Enkoping (Sweden)) U. S. Pat. 3,708,266. 5p., Jan. 2, 1973. 8 refs. (Appl. July 24, 1970, 6 claims).*

An apparatus for cleaning sulfur dioxide flue gases, particularly those originating from coal or oil-fired systems, incorporates a co-current absorption column having an inlet and an outlet for the flue gases and a circulating system for an absorbent liquid which comprises a slurry of a sulfur dioxide absorbing substance such as calcium carbonate in the form of powdered limestone and which is used to wash the sulfur dioxide from the gaseous outflow. The absorbent material slurry is circulated through or adjacent to the bottom of an upstanding absorption column through which the flue gas passes. A mill for grinding the reacted slurried absorbent particles is provided in order to remove the sulfite and/or sulfate compounds which coat and inactivate the absorbent and to expose additional active surface. The reacted absorbent slurry is removed from a droplet separator through a circulation conduit and returned to the process via a preparation vessel. Clean gas is removed through an outlet.

31697 **APTIC NO. 53617**

Harris, Dale K. and Louis R. Soulier

BAG HANGER. *(Cities Service Co., New York) U. S. Pat. 3,710,559. 5p., Jan. 16, 1973. 3 refs. (Appl. June 25, 1971, 3 claims).*

A bag filter unit for the removal of entrained solids from gases has been designed to permit easy removal and attachment of the bags to a hanger plate. One end of the bags is secured to openings in the bag house floor, while the other ends are suspended from an elongated hanger plate located in the upper part of the bag house. The plate is provided with slots at spaced intervals along its length, and each slot extends from the edge of the plate toward the center line. Suspension rods attached to the top of the bags extend upwardly, pass through the slots in the hanger plate, and are selectively movable laterally into and out of the slots. Springs rest on the plate and urge the rods in an upward direction, thus maintaining tension on the bags. Suspension rods can be inserted in or removed from the slots in the plate, with the springs in place, by firm lateral pressure on the rods. (Author abstract modified)

31698 **APTIC NO. 53666**

Hausberg, Gerhard and Karl-Rudolf Hegemann

APPARATUS FOR CLEANING FLUE GASES OF BLAST FURNACES AND THE LIKE. *(Gottfried Bischoft Bau Kompl. Gasreinegungsund Wasserruckkuhlanlagen Kommanditgesellschaft, Essen (West Germany)) U. S. Pat. 3,726,065. 8p., April 10, 1973. 5 refs. (Appl. Oct. 12, 1971, 10 claims).*

An apparatus for scrubbing particle-laden waste gases, such as those of a Bessemer converter, before releasing them into the atmosphere, has been designed to provide means for stabilizing the output pressure at substantially its optimum value in the face of widely varying input pressures. Flue gases from a high pressure blast furnace are led from above through a dustbin to a wash tower containing several spray heads above a nozzle forming an annular accelerator gap of adjustable width. Adjustment of the gap width is carried out continuously, under control of pressure sensors upstream and downstream of the gap, to maintain a constant output pressure, except with abnormally low flue gas pressure; in the latter case an alternate control circuit takes over to maintain a constant pressure differential across the gap. A group of such nozzles, in separate towers or in a common tower, may operate with different and mutually complementary pressure characteristics and may be selectively activated by an upstream pressure sensor whenever the flue-gas pressure fails within the linear range of its characteristic. (Author abstract modified)

31699 **APTIC NO. 53579**

Heard, John P.

POLLUTION CONTROL APPARATUS. *(Assignee not given.) U. S. Pat. 3,713,276. 5p., Jan. 30, 1973. 9 refs. (Appl. May 19, 1971, 7 claims).*

A pollution control apparatus has been designed to accomplish the separation of suspended solids from a gas stream and to provide a means by which waste water having undesirable solids can be efficiently evaporated to reduce the volume of liquid waste requiring disposal. The device consists of a vertical tower composed of several sections, each of which contains a tent-like structure for subjecting a stream of gas to a washing action. The lowermost section has a combustion chamber and boiler. Flue gases from the combustion process are mixed with steam from the boiler and flow along a tortuous path up through the various sections of the tower. Various portions of the ascending gases are split from the main flow and are subjected to a washing action. The final remaining flow of gases emerges from the uppermost portion of the tower. (Author abstract modified)

31700 **APTIC NO. 53808**

Helms, Daniel G. and Leonard F. Vik

LAND USE PLANNING APPLICATIONS OF THE AIR CURTAIN DESTRUCTOR. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 28p., 1973. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-222.)*

The acceptability and problems associated with the air curtain destructor method (also known as an open pit incinerator or trench incinerator) of reducing land clearing waste are discussed as they relate to experience gained in Fairfax County, Virginia. The air curtain destructor method involves controlled burning in a specially designed open pit. This form of controlled burning was incorporated into the Fairfax County Ordinance on Air Pollution Control following the revocation of State approval of the ordinance in April, 1971. This revocation effectively instituted a ban on open burning in the rapidly growing suburban county and forced the search for an economic solution to the problem of land clearing waste disposal. The air curtain destructor provided for a substantial reduction in air pollution emissions at comparatively low cost. In order to reduce the volume of waste to be handled in this manner, it was determined that marketable timber would be salvaged for use as lumber, paper pulp, or fireplace wood, and that large stumps would be buried in the County s sanitary landfill. These methods have resulted in an improvement in the air quality of the County while keeping increases in new home costs minimal; the public has greatly decreased the number of complaints formerly made regarding the County s air quality. In the future, attempts should be made to recycle (via chipping and composting) more of the land clearing waste generated in this area.

31701 **APTIC NO. 53901**

Hemsath, Klaus H., Arvind C. Thekdi, and F. Michael Lewis

APPLICATION OF REACTION KINETICS AND MIXING STUDIES IN DESIGN OF A FUME INCINERATOR. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1973. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28 1973, Paper 73-299.)*

Basic studies of the reaction kinetics of some typical fumes and the mixing characteristics of different types of mixers were used to develop industrial fume incinerators. The successful operation of several units designed from the data obtained during this research has shown that the hydrocarbon oxidation at and above 1430 F is mich faster than that given by several rules of thumb. Also, the presence of flame is not necessary to achieve the satisfactory incineration of common industrial fumes. Above approximately 1430 F, the reaction rates are controlled by mixing. Thus, it is necessary to provide a very efficient mixing system to avoid long residence times or excessive fuel usage. At lower incineration temperatures (below approximately 1400 F), one can reduce the hydrocarbon levels which can satisfy the air pollution regulations, although this can result in the formation of carbon monoxide, which is not only an equally undersirable pollutant, but is more difficult to remove by the incineration process. It is worth increasing the incineration temperature slightly to eliminate HC and CO simultaneously. (Author summary)

31702 **APTIC NO. 53910**

Hess, K. and R. Kotkamp

PHOSGENE DESTRUCTION BY THERMAL CONVERSION. *(Phosgen-Vernichtung durch thermische Umsetzung). Text in German. Chem.-Ing.-Tech., 45(13):873-881, July 1973. 4 refs.*

Computations of the thermal conversion reactions and an experimental study of the thermal conversion conditions of phosgene together with chlorinated hydrocarbons and considerable amounts of carbon monoxide, as occur in waste gases and vent air generated by chemical synthesis processes using phosgene as a primary material, are described. In continuously generated waste gas flows containing up to several thousand ppm of phosgene, the phosgene can be destroyed and converted quantitatively into hydrochloric acid through thermal conversion by means of natural gas in the presence of excess water vapor. The combustion chamber used for the thermal conversion should have fireproof lining to minimize corrosion hazards. The resulting hydrochloric acid fume may require subsequent scrubbing of the combustion gases. In the case of temporarily elevated phosgene concentrations in the waste gases, additional water vapor is necessary for the thermal conversion to reduce the residual phosgene concentration to below the limit of detectability. Also, the air excess coefficient should be as low as possible, or the conversion process should be conducted in two stages, maintaining air insufficiency in the first stage to minimize chlorine formation. The effective hold time for the maximum possible waste gas volume in the combustion chamber should be about 0.3 sec. When permanently high phosgene concentrations are to be destroyed, the combustion chamber should be followed by a quench and a HCl absorption column.

31703 **APTIC NO. 53651**

Holden, Herbert K.

FILTER. *(American Filtrona Corp., Richmond, Va.) U. S. Pat. 3,715,869. 5p., Feb. 13, 1973. 5 refs. (Appl. March 8, 1971, 15 claims).*

A bonded, activated carbon filter for air purification has been designed to provide good adsorptivity, low pressure drop, and disposability; the self-contained unit is easily manufactured at low cost and can be utilized in existing air conditioning equipment. The filter contains activated carbon and a thermosetting or thermoplastic resin binder and has a sufficient amount of voids to provide a pressure drop of 0 to 0.5 in. of water at a face velocity of up to 450 ft/min. The manufacturing method involves mixing the dry ingredients and sufficient water, charging to a mold, applying sufficient pressure (at least 250 psi), discharging the uncured mole piece, and curing the resulting filter. The preferred composition of the filter, using a thermosetting resin. contains 26% resin and 74% activated carbon in the dry mix. The curing time and temperature usually fall in a range of 225 F to 450 F for anywhere from 2 hr to 15 min. The void to filled surface area ratio is achieved by providing holes which are approximately 0.40 inch in diameter and are spaced approximately 0.50 inch on center. The peripheral holes are spaced approximately 0.75 inch on center from the edge of the filter. By using a larger particle size activated carbon for example, 20 by 50 mesh or 14 by 20 mesh, as compared with 80 by 325 mesh, the filled face area/void ratio can be as high as 84:16. This feature is particularly useful in environments requiring low air volumes and low pressure drops.

31704 **APTIC NO. 53883**

Holt, Eugene L. and Albert B. Welty, Jr.

REDUCTION OF SO2 IN GAS MIXTURES. *(Esso Research and Engineering Co., Linden, N. J.) U. S. Pat. 3,726,958. 6p., April 10, 1973. 4 refs. (Appl. Feb. 22, 1971, 9 claims).*

A convenient means for reducing by-product sulfur dioxide from a flue gas desulfurization process to elemental sulfur has been developed which utilizes an inexpensive, heavy, fuel grade hydrocarbon reducing agent which is suitable for burning in the steam boiler of an electric power plant. The sulfur dioxide-rich off gas stream is treated with a hydrocarbon oil such as gas oil, catalytic cycle stock, or residuum in the liquid phase at a temperature of about 250 F to about 800 F in order to reduce the sulfur dioxide. Hydrogen sulfide formed in the reduction can be reacted with a further quantity of sulfur dioxide to form elemental sulfur. At least a portion of the hydrocarbon oil after reaction with sulfur dioxide may be burned in a furnace in which flue gas containing sulfur dioxide is formed. (Author abstract modified)

31705 **APTIC NO. 53668**

Hungate, Ernest C., Harold A. Ogletree, and Grason T. Nickell

METHOD OF CONTROLLING THE EMISSION OF ODORS AND PARTICULATE MATTER. *(Air Conditioning Corp., Greensboro, N. C.) U. S. Pat. 3,726,062. 7p., April 10, 1973. 5 refs. (Appl. Dec. 31, 1970, 11 claims).*

A method for utilizing an air conditioning apparatus to remove odor and particulate matter from a gas provides improved contact efficiency over the prior art via an additional contact treatment of the gas with a chemical solution during the elimination step, particularly in high velocity systems. The gas is first passed at a relatively high velocity through a chamber containing a densely-sprayed chemical solution which is designed to produce a very high contact efficiency between the gas and the liquid. A large portion of the particulate matter in this chamber is collected and suspended in the solution, and a high proportion of the odors are absorbed. In one embodiment, 965 gal/min of solution are used in a 100,000 cu ft/min apparatus so that the density of the solution in the spray chamber is about 9.65 times 10 to the -3 gal/cu ft of gas flow. The gas is subjected to a second cleaning and odor reduction step wherein the gaseous discharge stream from the spray chamber is again intimately contacted with the solution while simultaneously separating the chemical solution from the gas to be discharged from the equipment. The solutions may be acidic, basic, masking, oxidizing, neutralizing, or reacting. Specific solutions disclosed include solutions of water with sodium bicarbonate, sodium bisulfite, sodium hydroxide, chlorine dioxide, potassium permanganate, and calcium hypochlorite. Chlorine gas may also be introduced into the air stream for the same purpose. (Author summary modified)

31706 **APTIC NO. 53582**

Hurst, Robert H.

ANTIPOLLUTION EXHAUST SYSTEM FOR AN INTERNAL COMBUSTION ENGINE. *(Clevepak Corp., New York) U. S. Pat. 3,712,065. 7p., Jan. 23, 1973. 9 refs. (Appl. Dec. 4, 1970, 20 claims).*

An antipollution exhaust system for reducing the back pressure on the exhaust line of an automobile, for example, has been designed to incorporate the introduction of secondary air to exhaust gases, thus achieving the desired back pressure reduction without the previously required high energy input. The device includes a source of compressed air, which may be powered by the internal combustion engine, and, in particular, a unique momentum transfer pump device which utilizes the high pressure compressed air output to create a suction or lower pressure at the exhaust manifold. A diffuser may be connected at the output end of the momentum pump to further increase the efficiency of the momentum pump. The air compressor should be capable of developing at least 20 psig, and pressures up to 90 psig are presently considered to be the most useful. The made-up air for the compressor may be supplied from a tap in the manifold upstream of the pump. The sizing of the various components (e.g., the compressed gas supply source, the plenum chamber, and the jet bores, as well as the passage) will be selected according to the back pressure reduction desired.

31707 **APTIC NO. 53770**

Ikegami, Makoto, Etsuzo Kawai, and Yasushi Kihara

REDUCING OXIDES OF NITROGEN IN A DIESEL ENGINE BY MEANS OF EXHAUST GAS RECIRCULATION. *(Haiki saijunkan ni yoru dizeru enjin no chisso sankabutsu no teigen). Text in Japanese. Jidosha Gijutsu-*

kai Ronbunshu (Proc. Soc. Automotive Engrs.), no. 5:3-9, June 1973. 6 refs.

The reduction of nitric oxide exhaust from a diesel engine by cold recirculation was studied both theoretically and experimentally. It was confirmed that cold recirculation can reduce NO without obstructing combustion itself. High load causes an increase of smoke in a similar manner caused by air deficiency due to recirculation. But at a low load, the change is similar to lowering of flame temperature by the increase of heat capacity. Therefore, a considerable reduction of NO can be achieved at low load despite a small recirculation rate. The NO is produced by local changes occurring in the engine, and NO reduction can be achieved independently regardless of fuel injection time.

31708 APTIC NO. 53777

Itoh, Makoto

DESIGN OF A LAMINAR FLOW PATIENT ISOLATION ROOM. *(Mukin byoshitsu no kenchiku sekkei). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 11(2):25-32, June 1973. 4 refs.*

A clean air laminar flow patient isolation room with a high efficiency filter is discussed. The walls are compared of prefabricated panels, part of which should be a ventilation filter. Air conditioning is achieved by laminar flow from the clean air outlet through a high efficiency particulate air filter (HEPA filter) installed on the wall above the patient s head. A suction prefilter is on the ceiling near the wall, above the headboard. Flow can be adjusted to 0.25-0.5 m/sec. A pollution source should not flow over the head of the patient.

31709 APTIC NO. 53908

Iwai, Nobuo, Teitaro Tsuchida, and Satoshi Kato

RELATION OF COMBUSTION AND NO EMISSION AT EGR OF 4-STROKE GASOLINE ENGINE. *(4-saikuru gasorin enjin no EGR-ji no nensho to NO). Text in Japanese. Jidosha Gijutsukai Ronbunshu (Proc. Soc. Automotive Engrs.), no. 5:10-15, June 1973. 4 refs.*

The relationship between the amount of nitric oxide emission from a gasoline engine and the exhaust gas recirculation combustion process (EGR) were examined. When spark timing was fixed and exhaust gas was recirculated, NO decreased greatly, but some of this was due to delayed ignition time. When spark timing was set to MBT, combustion delay was improved and the decrease of NO became purely the result of exhaust gas recirculation. The NO formation was hypothesized as nitrogen plus oxygen yield two nitric oxides; the reaction speed and speed constant at the maximum temperature were obtained; and the factors influencing NO formation were clarified. It was confirmed that the decrease of NO by EGR is caused by lowering of temperature as in the case of delayed spark timing, and NO increase by air-fuel ratio is an effect caused by the multiplication of temperature and concentration.

31710 APTIC NO. 53890

Jackson, Dennis Hurshal

EMISSION AND POLLUTANT RECOVERY PROCESS AND APPARATUS. *(Assignee not given.) U. S. Pat. 3,729,901. 6p., May 1, 1973. 10 refs. (Appl. July 20, 1971, 4 claims).*

An emission and pollutant recovery apparatus for entrainment and purification of contaminated gases has been designed so that contaminates are positively collected by means of a suction device and conveyed under positive pressure through conduits to liquid filled tanks where the contaminates are removed by bubbling the contaminated air through liquid. Suction is applied through conduits and an annular chamber to draw the contaminated exhaust gases from the central chamber through slots into another chamber. Generally, the gases are blown by positive pressure to one of two liquid filled tanks, enabling one to be cleaned while the other is operating. The apparatus is extremely efficient and relatively inexpensive in construction and operation; it also provides a collector device which may be installed directly on exhaust flues or mounted in a relatively confined space.

31711 APTIC NO. 53590

Johswich, Friedrich and Werner Schindelbeck

ADSORPTION METHOD AND APPARATUS FOR TREATING POLLUTED GAS STREAMS. *(Chemiebau Dr. A. Zieren G.m.b.H. and Co. K.G., Koln-Braunsfeld (West Germany)) U. S. Pat. 3,708,981. 5p., Jan. 9, 1973. 5 refs. (Appl. Sept. 11, 1970, 10 claims).*

A moving-bed, gas-solid contact method which is especially suitable for the adsorption of sulfur oxides and/or nitrogen oxides from industrial waste gases on carbon-containing adsorbents has been developed to eliminate the problem of clogged adsorber walls, common to other such devices, by the provision of a special set of pressure-absorbing baffles. The perforated vessel wall of the apparatus contains a row of louvers downwardly inclined from the outside toward the inside in a substantially parallel relationship and arranged in the manner of a jalousie, one above the other. A second row of baffles is spaced behind and adjacent to these louvers. The baffles adsorb the static lateral pressure of the downwardly flowing adsorbent and protect that minor portion of the adsorbent between the louvers from being exposed to the lateral pressure, thereby permitting the minor portion to combine with the main flow of the adsorbent. The cooperation between louvers and pressure relief baffles ensures a continuous flow of adsorbent in the zone of the louvers, thus removing a stationary adsorbent phase between adjacent louvers. Hence, dust taken by the outermost layer of adsorbent is entrained continuously into the main stream together with adsorbent such that clogging of the granule interspaces of this layer due to the deposition of dust is impossible.

31712 APTIC NO. 53614

Jones, William D.

ANTI-POLLUTION BURNER SYSTEM. *(American Metal Climax, Inc., New York) U. S. Pat. 3,719,471. 7p., March 6, 1973. 10 refs. (Appl. Jan 23, 1970, 1 claim).*

A system for treating partially combusted waste gases obtained from the destructive distillation of insulated copper wire scrap while recovering the metal as blister copper has been developed to eliminate gaseous by-product pollution of the atmosphere and to inhibit corrosion of the assembly, a common problem with such devices. The waste gas is fed to an afterburner assembly comprising a water-cooled housing having a burner section, a waste gas inlet opening in a side wall which communicates with the burner, and a closed end opposite the burner section. The partially combusted waste gas is fed into the inlet opening and then into the burner where the waste gas undergoes substantially complete combustion to form effluent gas which is preferably further treated by passing it through a scrubber, then through an electrostatic precipitator, and finally through a vent to the atmosphere as relatively clean effluent gas. All of the structural parts of the burner assembly with which the hot organic vapors come in contact are water cooled; hence, high temperature corrosion by the vapors which may range in temperature as high as 1200 or 1300 F is greatly inhibited.

31713 APTIC NO. 53757

Kaeser, E.

POLLUTION OF DRINKING WATER IN THE RESERVOIR BY AIR POLLUTANTS. *(Gefaehrdung des Trinkwassers im Reservoir durch Luftverunreinigungen). Text in German. Schweiz. Bauztg., 91(36):866-867, Sept. 6, 1973.*

For ventilation of drinking water reservoirs, external air is drawn in which usually carries soot, street dust, and other particles. These air pollutants settle on the water surface and on the reservoir walls. For retention of this particulate matter two filter systems are available, the closed system suitable primarily for new reservoirs and the open system which can be installed in existing reservoirs. With the closed system the filter cells are accommodated in a closed casing which is connected by synthetic pipes with the water chamber on the one side and the air inlet on the other. The fine dust filters are carefully sealed off against each other and the casing. With the open system the casing with the fine filters is installed in the air inlet opening of the reservoir wall. As many filters must be installed as there are water outlets. Each filter cell can be loaded with 100 to 200 cu m/hr. An illustration of the two filter systems is given.

31714 **APTIC NO. 53720**

Kato, Seitaro

THE PRACTICE AND APPLICATION OF VARIOUS DEODORING TECHNIQUES. *(Kakushu dasshu gijutsu no jissai to tekiyo). Text in Japanese. Preprint. Kogai Kankyo Taisaku Center, Tokyo, 50p., 1973. (Presented at the Seminar on the Practice and Application of Bad Odor Countermeasure Techniques, Tokyo, Japan, Aug. 1-2, 1973.)*

Deodorizing methods include burning, absorption, adsorption, masking, neutralization, dilution, microbiological, and scrubbing methods. Incineration can be used to remove organic gases by heating them for over 0.5 sec at temperatures of 650-800 C. Absorption in scrubbers can be used to remove hydrogen sulfide and lower fatty acids.

31715 **APTIC NO. 53877**

Kawada, Seiya

BIOCLEAN TECHNIQUES FOR A LAMINAR OPERATING CLEAN ROOM. *(Mukin shujutsushitsu no baiokuriin gijutsu). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 11(2):33-72, June 1973. 54 refs.*

A laminar system for clean rooms is discussed including costs, air flow, and construction. A high degree of cleaning can be obtained which has not been obtained by the turbulent flow system. The construction cost is less than that of a turbulent flow system. The prefabricated system can be easily moved and converted. All filters are high efficiency particulate air (HEPA) filters. Ventilation in clean rooms is discussed. Hospitals which have clean rooms are listed.

31716 **APTIC NO. 53677**

Kawase, Buntaro, Iwao Kojima, and Kunio Otani

METHOD OF REMOVING MERCURY VAPOR FROM GASES. *(Showa Denko K. K., Tokyo (Japan)) U. S. Pat. 3,725,530. 4p., April 3, 1973. 4 refs. (Appl. Jan. 18, 1971, 7 claims).*

A more economical and efficient process for the removal of mercury vapor from by-product hydrogen gas generated by mercury electrolytic cells used for caustic soda manufacture has been developed which will reduce the mercury content in the gas to less than 0.01 mg/cu m. The gas to be purified is washed with an aqueous solution of acid (10 to 30% concentration by weight) and persulfate ions ranging from 0.5 to 1.5 wt% on the basis of the total weight of the acid solution. The acid component may be selected from any of the following: sulfuric acid, hydrochloric acid, nitric acid, oxalic acid, and sulfamic acid. The washing is carried out at a normal temperature under a normal pressure, and the gas is contacted with the acid solution by countercurrent flow through a packed tower. The mercury is recovered from the solution by the addition of sulfur dioxide as a reducing agent at a temperature of about 60 C and a pressure above atmospheric. The acid solution, following recovery of mercury, has additional persulfate added and is recycled for further washing of mercury vapor containing gas.

31717 **APTIC NO. 53868**

Kawase, Zenichi

REMOVAL OF FLUORIDES IN ROOF-TILE-KILN. *(Kawara seizokojo ni okeru fussokagobutsu no jogairei). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(4):389-393, April 1973.*

On roof-tile-kiln company uses a washing tower and settling tanks to remove fluorides from waste gases. The temperature of the gas is lowered to 80 C near the inlet of the washing tower by a long cooling path. The pH of the absorbing solution is controlled to more than 8 by adding sodium hydroxide. Thus, the concentration of hydrogen fluoride in the gas can be decreased from 5.8-11.2 ppm to 0.3-0.9 ppm, and 100 ppm of sulfur dioxide can be removed. Another company uses a washing tower, two circulating tanks, and a settling tank to remove HF. The gas temperature is lowered to 100 C by a shower, and the pH of the absorbing solution is controlled to higher than 7 with HaOH. When a solution of sodium fluoride occurs in the circulating tanks, one tank is stopped, and the solution is transferred to the settling tank where fluoride is settled in the form of calcium fluoride by adding slaked lime. The concentration of emitted fluoride can be decreased from 6.8 ppm to 0.8 ppm, and SO2 is decreased to less than 1 ppm.

31718 **APTIC NO. 53867**

Kayama, Takao

REMOVAL AND RECOVERY OF FLUORINE COMPOUNDS. *(Fusso kagobutsu no jogai to kaisyu ni tsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(4):395-402, April 1973. 7 refs.*

The emission, removal, and recovery of fluorine compounds such as hydrogen fluoride and silicon tetrafluoride from glass fiber industries are discussed. The emission standards of fluorine and HF are tabulated. The dry and wet removal systems can be used to remove fluorides. Emitted HF concentrations are 540 ppm without a control system and 1.4 ppm after the stack gas goes through a dry removal system. The latter is less than the 11.2 ppm emission standard.

31719 **APTIC NO. 53583**

Keller, Darryl E. and Donald R. Monson

CENTRIFUGAL AIR CLEANER WITH STATIC CHARGE DISSIPATING STRUCTURE. *(Donaldson Co. Inc., Minneapolis, Minn.) U. S. Pat. 3,713,280. 6p., Jan. 30, 1973. 5 refs. (10 claims).*

A centrifugal air cleaner with a static charge dissipating structure provides for a tubular member with vanes to swirl air passing through, thus centrifugally separating particles from the air. The tubular member and means are injection molded from plastic, preferably polypropylene, and contain aluminum or equivalent fibers to dissipate the static charge being formed by the impact of randomly charged airborne particles on the inner wall surface. Best results have been achieved by using 0.005 by 0.005 by 1/8 in. aluminum fibers. The smallest possible cross-sectional area provides maximum performance, but if the fibers are too small in cross section they tend to break in the blending and molding processes. This shortens the average fiber length thus requiring that more fibers be added to insure adequate electrical properties. The minimum usable cross-sectional area of the fibers is approximately 0.000009 sq in. Cross-sectional area should not exceed 0.000036 sq in., otherwise too much weight will be added. (Author abstract modified)

31720 **APTIC NO. 53695**

Kenahan, C. B., R. S. Kaplan, J. T. Dunham, and D. G. Linnehan

BUREAU OF MINES RESEARCH PROGRAMS ON RECYCLING AND DISPOSAL OF MINERAL-, METAL-, AND ENERGY BASED WASTES. *Bureau of Mines Information Circ., no. 8595:33-34, 1973.*

A promising method for treating sulfur dioxide bearing stack gases generated has been developed. While sulfuric acid production, the only well established process for removing SO2 from waste gases, is economically prohibitive for gases containing less than 3.5% SO2, the new citrate process has potential for treating gases containing only a fraction of 1% SO2. Also, the end product of the citrate process, sulfur, is preferable to acid because it is more easily marketed and can be stored with a minimum of land, air, or water pollution. A small test unit operating at a Western smelter proved that the new process can effectively capture more than 90% of the sulfur from the flue gas of a reverberatory furnace. An improved scheme for removing sulfur from the citric acid-sodium citrate absorption solution and an alternative steam stripping method that removes the absorbed SO2 as a concentrated gas have been developed.

31721 APTIC NO. 53680

Kobayashi, Shigehiko, Kazuhide Miyazaki, and Michaki Yamamoto

EXHAUST GAS CATALYST. *(Mitsui Mining and Smelting Co., Ltd., Tokyo (Japan)) U. S. Pat. 3,715,322. 7p., Feb. 6, 1973. 4 refs. (Appl. July 28, 1970, 10 claims).*

An improved method for oxidizing and purifying carbon monoxide containing exhaust gases from gasoline engines, kerosene stoves, chemical plants, and a wide variety of other sources has been achieved by combining the catalytic functions displayed by manganese oxides and lead oxides, and preferably a third agent such as an alkali earth metal oxide, a transition metal, a rare earth metal, silicon dioxide, aluminum oxide, aluminum, copper, tin, or other similar metal. The present catalyst is capable of disposing a large quantity of exhaust for many hours and also for displaying a combustion-aiding effect. It requires no humidity adjustment and is extremely thermally resistive. The optimum mixing ratio for the preferred three agent type catalyst is 50:50(5-10) in terms of weight. The effective mixing ratio limits are 10:90(2-40) to 90:10:(2-40). Tests indicate that the preferred form is capable of intensively oxidizing CO in an amount exceeding 1000 times the chemical equivalent of materials that comprise the catalyst. Manganese nitrate, lead nitrate, or both can be used as a binder to manufacture the catalyst in pellet form.

31722 APTIC NO. 53915

Kofink, Siegfried

DEVICE FOR THE COMBUSTION OF BURNABLE COMPONENTS OF EXHAUST GASES. *(J. Eberspacher. Esslinger (West Germany)) U. S. Pat. 3,737,286. 4p., June 5, 1973. 1 ref. (Appl. April 20, 1971, 9 claims).*

A device for the combustion of burnable exhaust gas components from low power internal combustion engines and aircraft engines has been designed to provide optimum detoxication of exhaust by incorporating a heat pipe along the length of the exhaust passage to insure optimum afterburning of the burnable exhaust products. The apparatus also includes a means for directing an air supply into the exhaust conduit in order to aid in the combustion of exhaust gases under certain conditions. The heat pipe consists of a tubular zone closed on all sides and evacuated on the interior. A capillary fabric is arranged adjacent the inside face, and the pipe is filled with a volatile liquid such as sodium or potassium. The pipe is capable of transferring heat with about 10 times the conductivity of copper. The practical construction is such that the temperature gradient over the entire length of the heat tube is substantially zero. (Author abstract modified)

31723 APTIC NO. 53855

Kokura, Tatsuro

ODOR CONTROL IN PULP FACTORIES. *(Parupu kojo ni okeru akushu taisaku). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 40(8):747-759, Aug. 1973.*

Odor complaints are the second most frequent public nuisance complaint, next to noise and vibration. Odors are mostly due to agriculture and fisheries (38%) and manufacturing (37%). The pulp and paper industry is often the cause of complaints due to methyl mercaptan, hydrogen sulfide, dimethyl sulfide, and dimethyl disulfide odors. The pollutants produced during the dissolution of wood and washing are either absorbed by an alkaline solution or chlorinated water or oxidized by direct contact with a flame after complete removal of moisture. Hydrogen sulfide resulting from the reclamation of sulfite lye can be reduced to 1/10 by oxidation of the sulfite lye before contact with hot gases in a contact evaporator. Secondary air, air turbulence, and lye spraying are related to the formation of H2S in the reclamation boiler. The boiler should be operated at a certain load, secondary air should be adjusted to have 3% excess oxygen, and the lye spray should not be excessively atomized to reduce H2S.

31724 APTIC NO. 53596

Kovach, Julius Louis

METHOD FOR HIGH EFFICIENCY FILTERING SYSTEM. *(North American Carbon, Inc., Columbus, Ohio) U. S. Pat. 3,720,043. 7p., March 13, 1973. 6 refs. (Appl. June 22, 1970).*

A process for high efficiency filtering of both particulate and gaseous radioactive contaminants has been developed; the process has improved characteristics relative to withstanding pressure shocks, flooding, and overheating as well as having the capability of in-place regeneration, thus eliminating costly and time consuming replacement of the filter apparatus and media. A single bed of granular adsorbent material several times the depth employed in conventional adsorbent filters functions to remove both gaseous and particulate matter from the incoming air stream. Relatively large particle sizes are used to form the bed compared to the small particle sizes used in prior conventional adsorbent beds. The bed is characterized by a given minimum depth of adsorbent particles of a given minimum size range which is preferably calculated on a basis dependent upon a given minimum removal efficiency of radioactive gaseous and particulate matter. The present process permits the incorporation of other filter media to substantially increase the removal efficiency of particulate matter over a wide particle size range, including the Aitken nuclei size range.

31725 APTIC NO. 53881

Kreimann, Herbert H.

AGITATOR FOR MARBLE BED GAS SCRUBBER. *(Combustion Engineering Inc., Windsor, Conn.) U. S. Pat. 3,727,381. 5p., April 17, 1973. 5 refs. (Appl. March 26, 1971, 1 claim).*

A wet scrubber for removing impurities from contaminated gases has been designed with a fluidized bed containing nozzles through which high velocity jets of fluid are directed horizontally into the bed, causing agitation to prevent plugging of the bed passages. The combustion gases enter the scrubber housing through an inlet and pass upwardly through water sprays where many of the solids are captured by the water droplets. The gases then flow through several tortuous, diverse passages formed by marbles within the filter bed. Intimate contact of the remaining free solids with water allows entrapment of these particles by the water. Any liquid carried over from the filter bed along with the gases is separated out by a demister. The flow velocity of the gases through the scrubber is generally such that the marbles within the bed are maintained in a fluidized state, and the velocity of the water jets issuing from the agitator nozzles is such that they cause agitation of the entire bed. The agitation prevents plugging of the diverse paths formed by the layers of marbles with solid contaminants or gases of low flow velocity through the scrubber.

31726 **APTIC NO. 53785**

Krippene, B. C.

NITRIC OXIDE REDUCTION THROUGH CONTROLLED COMBUSTION - A CHALLENGE TO THE BOILER DESIGNER. *Preprint, Instrument Society of America, 11p., 1973. (Presented at the National Power Instrumentation Symposium, 16th, Chicago, Ill., May 23-25, 1973, Paper BR-997.)*

Modifications to boiler combustion processes to meet Federal limits for nitrogen oxides emissions from fossil fuel fired power plants are discussed. More efficient burners were designed for use with the two-stage combustion process that have optimum individual flame stability and are adjustable to achieve the best burner performance while the burner is in operation. Low NOx burners were developed to burn high sulfur fumes and bituminous coal and oil without the use of the two-stage combustion. Burner control was removed from a per burner basis and reestablished on a per pulverized basis. This minimizes burner operation and control hardware considerations significantly for large pulverized coal fired boilers, while improving the capability for fuel/air ratio control to each burner.

31727 **APTIC NO. 53941**

Kyle, M. L., E. J. Cairns, and D. S. Webster

LITHIUM/SULFUR BATTERIES FOR OFF-PEAK ENERGY STORAGE: A PRELIMINARY COMPARISON OF ENERGY STORAGE AND PEAK POWER GENERATION SYSTEMS. *Argonne National Lab., Ill., Chemical Engineering Div., 114p., March 1973. 133 refs.*

NTIS: ANL-7958

The use of pollution-free lithium/sulfur batteries as load-leveling devices in electrical utility networks could provide both economic and ecological benefits in meeting the growing demand for energy. A battery designed for this application should have an initial capital cost of $12 to $15/kW-hr of energy storage capacity and a lifetime of at least five years. A typical duty cycle is expected to be a 10 to 14 hr discharge followed by a 4 to 8 hr charge with the battery operating about 5 days per week. This paper presents both economic and cell performance goals for the development of a battery system. A preliminary comparison of the costs of batteries, pumped hydroelectric storage and gas turbines indicate that, under some conditions, batteries should be considered as load-leveling devices. The lithium/sulfur battery system is in too early a state of development to accurately predict its place in the utility system. However, consideration of current laboratory cell performance and projected battery costs indicate that further research to determine if a viable system can be developed is warranted. (Author abstract)

31728 **APTIC NO. 53586**

Labadie, Paul A.

EXHAUST FILTER UNIT AND METHOD OF FILTERING EXHAUST. *(Farr Co., El Segundo, Calif.) U. S. Pat. 3,708,957. 8p., Jan. 9, 1973. 4 refs. (Appl. Feb. 19, 1971, 31 claims).*

A high efficiency, self-cleaning, pressure-controlled filter for removing combustion engine crankcase pollutants and recycling of the exhaust back into the engine has been developed to permit passage of the exhaust through the air intake filter for pressure control purposes without damaging the air intake paper filter media. The device will also collect oil droplets in the crankcase exhaust and subsequently return the collected oil to the crankcase. The filter consists of a high density filter media which is rotatably mounted within an enclosed area. Exhaust from the crankcase is communicated into the enclosed area and through the filter media to separate oil droplets and the like from the exhaust. The filter media is operably connected to the engine drive and rotated as the exhaust is passed through to spin off the oil and other collected matter. The filtered exhaust is recycled into the engine through the air intake filter, and the separated oil is returned to the crankcase.

31729 **APTIC NO. 53840**

Lewakowski, John Janusz

ENGINE EXHAUST RECIRCULATION. *(Assignee not given.) U. S. Pat. 3,738,342. 6p., June 12, 1973. 4 refs. (Appl. Dec. 27, 1971, 10 claims).*

An automobile engine exhaust recirculation system has been designed to achieve preheating and improved mixing and carburetion of the fuel-air mixture in the inlet header, the reduction of ice formation on the customary throttle blade, the reduction of noxious nitrogen oxides in the exhaust, and the solution or avoidance problems of complexity and poor efficiency associated with the prior art. Operationally, a recycling valve in the bypass duct is opened or closed upon the opening or closing, respectively, of a conventional blade type throttle valve by virtue of a servo valve coupled with the throttle valve, recycling valve, and a pressure actuated device. The latter is responsive to the pressure in the induction conduit at the leading edge of a blade type throttle valve; the recycling flow of exhaust gases is increased as the throttle valve opens from its idle position and is decreased or stopped when the throttle valve is at either its idle or wide open position. The bypass duct and recycling valve are dimensioned so that ordinarily more than 5% but less than 25% and usually 15% of the total exhaust gases will be conducted through the bypass duct.

31730 **APTIC NO. 53926**

Lewis, F. Michael, Ernest W. Weaver, Jr., and Henry P. Streicher

THERMAL ABATEMENT OF A SCRUBBER PLUME FROM AN ASPHALT PLANT. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1973. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-328.)*

The thermal abatement of a scrubber plume from an asphalt plant in Toledo, Ohio is described. Alternate solutions utilizing nonplume producing particulate control devices, such as bag houses, were examined, but proved to be too expensive in initial and operating costs in the light of existing code requirements. Thermal abatement of the plume was recommended because of limited session of plant operation, certainty of plume control, resulting higher stack, greater lift of stack plume due to heating, and lower cost than other methods considered. The ambient weather conditions that resulted in plume complaints were determined by an examination of the records of the Air Pollution Control Code. The thermodynamic state conditions and mass flow rate of the stack were obtained from the earlier stack emission test. With the aid of a high temperature Psychrometric Chart, a heat and material balance was performed to determine the exact amount of heat input required to eliminate the visible plume. A significant portion of the design task was the incorporation of the plume heating system into the existing plant process without adversely affecting plant performance. After the equipment was installed, operational tests were conducted. The equipment demonstrated the ability to significantly reduce and eliminate the visible plume. The substantial increase in plume rise, caused by the increased buoyancy of the reheated plume, greatly assisted in plume dispersion and on many days it was not necessary to completely eliminate the visible plume to reduce neighborhood complaints. (Author abstract modified)

31731 **APTIC NO. 53850**

Liebig, Preston Dean

MODULAR AIR POLLUTION CONTROL SCRUBBER BED. *(Combustion Engineering, Inc., Windsor, Conn.) U. S. Pat. 3,739,555. 7p., June 19, 1973. 6 refs. (Appl. Dec. 30, 1971, 10 claims).*

A gas scrubber with a multi-sectional bed has been designed to maintain the desired turbulent level without the use of an overflow structure and to provide protection for other internal components in the event that the bed material is blown. Plates which form the facing sides of adjacent modules are oppositely inclined to form a trough. The height of the module sides is equal to the pre-determined turbulent level of the system, and this level is maintained by providing a means for liquid discharge for disposing of water overflowing from the modules into the troughs. Each scrubber module is provided with a grill type cover which is capable of containing the filter material under normal operating conditions; and, in the event the filter bed is blown, the cover grill protects the mist eliminator and other internal components from damage. Overhead hangers are provided to engage the inclined sides forming the troughs; hence, no obstructions, structural or otherwise, are located under the filter bed where they would interfere with the scrubbing liquid spray and provide a surface for solid waste accumulation. (Author summary modified)

31732 **APTIC NO. 53766**

Maggs, F. A. P.

ADSORBENTS IN AIR FILTRATION. *Filtration Separation (Purley), 10(4):413-417, Aug. 1973. 10 refs. (Presented at the Filtration Society s Symposium, Advances in High Efficiency Air Filtration, London, England, 1973.)*

Adsorbents in filtration systems and methods of assessing filter performance are discussed. A large and accessible internal adsorbing surface is necessary for effective adsorption. Small granules in a filter bed are more efficient than large granules, but there is high air flow resistance with small granules. A balance must be maintained between adsorption efficiency and resistence. One solution to the balance problem may be the experimental and highly adsorbent charcoal cloth developed by the Chemical Defence Establishment (CDE). The cloth is a durable and flexible woven material consisting entirely of activated carbon. The air flow resistence will depend upon the type of weave. The cloth adsorbs 30% w/w, and is only slightly affected by humidity. All carbon surfaces hold less water than other adsorbents as silica gel or alumina. The general lack of specificity of carbon surface towards vapors adds to the usefulness of charcoal as an all adsorbent for filters. The most useful method of assessing filter performance is the measurement of penetration time or duration of the adsorption test. The CDE has a nondestructive test to measure adsorption in which a small pulse of test is injected into the air stream and the reduced concentration of the pulse is measured as it emerges from the filter. A weight of vapor less than 0.5% of the adsorptive capacity of the filter indicates a nondestructive test.

31733 **APTIC NO. 53576**

Maruoka, Hiroyuki

AFTERBURNER FOR INTERNAL COMBUSTION ENGINE. *(Nissan Motor Co., Ltd., Yokohama (Japan)) U. S. Pat. 3,716,996. 7p., Feb. 20, 1973. 3 refs. (Appl. Oct. 13, 1971, 10 claims).*

An afterburner system for minimizing hydrocarbons and carbon monoxide content left unburned in engine exhaust gases of an internal combustion engine is presented. In the system, an improved afterburning stabilizer is provided including a porous enclosure for uniformly mixing an additional air-fuel mixture, which is burned to form a premixed flame for anchoring the main combustion contaminated exhaust gases. A number of projections are mounted upon the porous enclosure for producing small disturbances in the flow of the exhaust gases and for acting as a stable heat source for the main combustion when the premixed flame is formed close to the tips. The afterburning system is compact, with reliable ignition performance and without mis-fire or blow-off. (Author abstract modified)

31734 **APTIC NO. 53844**

Matsuo, Hiroshi

WASTE GAS DISPOSAL UNIT. *(Haigasu shokyaku sochi no gaiyo). Text in Japanese. Ishikawajima Harima Giho (Ishikawajima-Harima Eng. Rev.), no. 5:84-87, May 1973.*

Various flare systems are used for incineration of exhaust gases created by chemical plants. The grand flare type boiler eliminates toxicity, inflammability, and odor before discharging the gas into the air, but it is more expensive than the elevated flare type, or flare stack. The common flare burner, a smokeless type, and supplementary burners are discussed. Main attachments are separator drums, seal drums, flame arresters, and molecular seals. The design of an exhaust outlet is determined by the ground exhaust concentration and air dispersion from the standpoint of air pollution prevention. But for flarestacks, the design must also consider the protection of human life and of various equipment around the stack from the extremely high radiation heat. Ground exhaust concentration is calculated by the Sutton formula and adjustments are made by the height of the stack. Formulas are given for calculation of radiation heat and safety of equipment and human health. Design specifications for the flare stack of the Idemitsu Industries Chiba Oil Refinery are presented.

31735 **APTIC NO. 53842**

Matsuyama, Takuzo, Isao Aoki, and Hotoku Fukuzumi

CHEMICAL ENGINEERING STUDY OF ELECTRIC DUST COLLECTOR. *(Denki shujinki no kagaku kogaku teki kenkyu). Text in Japanese. Preprint, Japan Society of Chemical Engineering, Kansai Branch, p. 10-12, 1973. 6 refs. (Presented at the Japan Society of Chemical Engineering, Study Meeting, Himeji, Japan, Aug. 27-28, 1973.)*

Factors influencing electric dust collector efficiency are reported. The scraper method for removing dust collected on the electrode combined with raising the current density and making the electric field distribution uniform improve the efficiency of a small dust collector. A dust-containing gas was collected by an experimental electric dust collector and measured. With a wind velocity of 3 m/sec and a dust concentration of 4 g/cu m, the dust collection efficiency was more than 99%; the dust collecting performance did not decrease even after a lapse of 100 min. The dust piled on the electrode could be removed with a scraper with 95% removal efficiency.

31736 **APTIC NO. 53597**

Miczek, Gerhard

GAS SCRUBBING METHODS AND APPARATUS. *(Fisher Klosterman, Inc., Louisville, Ky.) U. S. Pat. 3,722,185. 7p., March 27, 1973. 3 refs. (Appl. June 9, 1971, 16 claims).*

A medium energy centrifugal-type wet scrubber for cleaning dust from industrial gases is described. The apparatus includes a contacting chamber with a means for providing a continuous water wash-down in the form of a substantially downward water sheet concentric to the chamber inner surface. Provision is made for dust-laden gas to enter the chamber tangentially and thereafter flow upwardly in a helical path whereby dust particles are centrifugally driven into the concentric water sheet. A means is provided inwardly adjacent the tangential inlet to substantially increase the efficiency of dust removal from the flowing gas. The structure of this flow effecting means preferably includes a plurality of vertically spaced-apart rigid ring-like members disposed to define annular channels. These channels serve to guide the gas stream, upon its entrance to the chamber, in a horizontal circular pathway to assure thorough contact of the gas flow with a water curtain formed at the gas inlet. The interaction of the gas flow with the water curtain results in an unusual improvement in the rate of particle removal from the gas flow whereby an impressively cleaner effluent is exhausted into the atmosphere. Hence, performance comparable to a high energy and relatively expensive venturi scrubber apparatus can be achieved. (Author abstract modified)

31737 **APTIC NO. 53841**

Mori, Tsunezo

EQUIPMENT FOR PREVENTING ENVIRONMENTAL POLLUTION CAUSED BY BULK MATERIAL HANDLING. *(Kaeki unpan kikai ni okeru kogai boshi setsubi). Text in Japanese. Ishikawajima Harima Giho (Ishikawajima-Harima Eng. Rev.), no. 5:170-178, May 1973.*

Various types of bulk material handling machinery with dust prevention devices are discussed with diagrams and photographs. Coal and iron ore unloaders have special dust prevention hoppers and grab buckets with spray water curtains. Appropriate amounts of water (in order to prevent water pollution) are sprayed from the three sides of the hopper which are covered by wind buffers. The water curtain is formed by two layers of water nozzles, approximately 10 on the lower level with a small water particle jet and five upper nozzles for greater resistance against wind. The upper nozzles are turned slightly upwards, forming a water spray curtain between grab buckets and the hopper. The V-shaped jet water sprays with a wide spray angle and reaches a considerable distance. The alumina unloader has a specially designed, tight sealing grab bucket by shell pin hinge. The outer walls have baffle plates and alumina powder settles back into the hopper. Other devices are the suction duct, dust collection, and bag filter, alumina dust is never discharged into the air while unloading and conveying. Pneumatic unloader grains, alumina ship loader, grain ship loader, and other types of dustless and noiseless loaders and unloaders are discussed.

31738 **APTIC NO. 53845**

Murayama, Tadashi and Minoru Tsukahara

A STUDY ON THE REDUCTION OF NOX OF DIESEL ENGINE - THE IMPROVEMENT OF NOX EMISSION UNDER THE SMOOTHENED COMBUSTION. *(Dizeru enjin okeru NOx teigen ni kansuru kenkyu -- nensho no seishukuka ni yoru NOx no teigen). Text in Japanese. Jidosha Gijutsukai Ronbunshu (Proc. Soc. Automotive Engrs.), no. 5:48-54, June 1973. 5 refs.*

Studies were made on the possibility of reducing the amount of nitrogen oxides emissions from a diesel engine. A vertical, water-cooled single cylinder diesel engine with an experimental preliminary combustion chamber was used for experiments. Engine rotations were varied and loads and fuel injection time were changed. Delay of fuel injection time was effective in controlling the power output and fuel consumption, and therefore in reducing the amount of NOx emission. If the fuel injection time is not delayed in the extreme, the combustion noise and the amount of exhaust smoke can be decreased simultaneously. By controlling the causes of noise such as combustion maximum pressure, the pressure increase rate, and the caloric productin rate, NOx concentration can be decreased. There is a clear correlation between engine noise and NO concentration. However, the delay of fuel injection in the preliminary combustion chamber not only makes the start difficult, but also reduces acceleration power. In order to adopt delayed fuel injection, these problems must be solved first. Further studies will be necessary for complete understanding of the mechanism.

31739 **APTIC NO. 53584**

Nagamatsu, Brian H.

CATALYTIC CONVERTER STRUCTURE. *(Ford Motor Co., Dearborn, Mich.) U. S. Pat. 3,719,457. 6p., March 6, 1973. 7 refs. (Appl. April 26, 1971, 2 claims).*

An improved catalytic converter for the purification of motor vehicle exhaust gases has been designed to substantially reduce particulate catalytic material attrition. Gas permeable baffles are positioned within a flow channel of the converter housing for the retention between them of particulate catalytic material which forms a catalyst bed. A principal feature of the invention resides in the use of a gas-permeable flow-control baffle; this baffle is positioned within the housing flow channel between and spaced from both the housing inlet and the upstream gas-permeable baffle. The flow-control baffle has several uniformly spaced openings for the passage of exhaust gases. The baffle's function is to reduce exhaust gas turbulence and velocity inequalities in the region between the flow-control baffle and the catalyst bed. This results in a substantial reduction of particulate catalytic material attrition in the catalytic converter.

31740 **APTIC NO. 53872**

Ogawa, M., T. Hirao, and M. Iwao

THE POLLUTION CONTROL SYSTEM IN GAS TREATMENT SECTION OF AMAGASAKI COKE WORKS. *(Amagasaki kokusu-amagasaki kojo kako bumon ni okeru kogai taisaku ni tsuite). Text in Japanese. Aromatikkusu (Aromatics), 25(5):218-224, May 1973.*

The coke works has 270 coke ovens with a capacity of coal treatment of 6650 tons/day and gas emission of 2,300,000 cu m/day. The Rodax process by Osaka Gas Co. for the removal of cyanides in stack gas was combined with a desulfurization process to produce gas ready for use. The process for the gas treatment consisted of primary cooling, decyanization, saturation, final cooling, scrubbing and washing with benzene, and desulfurization. Waste liquid from the decyanization process was treated with activated sludge to eliminate the offensive odor.

31741 **APTIC NO. 53595**

Okada, Masashi

INTERNAL COMBUSTION ENGINE EXHAUST GAS CONTROLLING DEVICE. *(Nippondenso Kabushiki Kaisha, Aichi-Ken (Japan)) U. S. Pat. 3,721,221. 5p., March 20, 1973. 6 refs. (Appl. Feb. 27, 1970).*

An internal combustion engine exhaust gas control device which operates a solenoid valve in response to a predetermined value of the automobile's engine speed has been developed. The solenoid valve communicates the carburetor's throttle valve mechanism to an atmospheric pressure circuit and simultaneously a vacuum retard diaphragm unit on the distributor to a suction manifold of the engine. The vacuum produced at deceleration is utilized to automatically operate the distributor vacuum retard diaphragm when the vehicle speed exceeds a predetermined value. Atmospheric pressure communicated to the throttle valve mechanism operates to prevent the valve from complete closure in case the vehicle is decelerated from a speed above the predetermined one. Hence, the exhaust of noxious gas from the internal combustion engine is greatly reduced. (Author abstract modified)

31742 **APTIC NO. 53656**

Osborn, Jack S.

DUST BAG QUALITY TESTING SYSTEM. *(Assignee not given.) U. S. Pat. 3,712,114. 8p., Jan. 23, 1973. 4 refs. (Appl. May 3, 1971, 15 claims).*

A method for selectively testing the condition of individual dust bags from outside an air filtration system in operation and selectively shutting off the flow through a given bag has been designed. The object is accomplished by inserting a probe tube through the wall of the inlet air chamber in line with the row of bag tubes through the tube sheet that separates the inlet air from the outlet air. The end of the probe tube is sealed into a selected one of the bag tubes, thus closing off the flow of dust-laden air from the inlet air chamber through the bag, but permitting the flow of measurement gas through the probe and into the bag. Such measurement gas flows at a selected constant rate or pressure through the probe, into and through the bag; and the respective pressure or flow rate is then measured. If the flow pressure is low, the permeability of the bag is too high, indicating a probable rupture in the bag. Too high a pressure indicates that the bag is ineffective in passing air. The invention further provides a means to close off the bag tube if a bag is ruptured. This is accomplished by placing a deflated, inflatable bladder on the end of the probe, with a needle piercing the bladder, inserting the bladder into the selected tube, inflating the bladder tightly inside the tube, withdrawing the needle (the bladder seals the needle hole), and withdrawing the probe. (Author summary modified)

31743 APTIC NO. 53655

Papastavrou, Antonios

POLLUTION CONTROL APPARATUS. *(Assignee not given.) U. S. Pat. 3,717,980. 4p., Feb. 27, 1973. 3 refs (Appl. April 27, 1970, 2 claims).*

A relatively simple and inexpensive pollution control apparatus for removing particulate matter from chimney smoke has been designed to operate with a high degree of efficiency and without introducing any blocking action which might interfere with the drafts of the chimney. Smoke from a chimney flows into the entrance of a flow path which has a downwardly extending portion which produces a downward velocity of particulate matter in the smoke. Another portion extends in an upward direction and is situated between the downward portion and an exit opening. Receiving means are located below the downward portion to receive the particulate matter. This comparatively simple arrangement allows sufficient kinetic energy to be imparted to the particles such that they move downward into the receiving means and, hence, are removed from the smoke. A pipe means which extends downwardly from a point below the downwardly extending portion of the flow path to a collection chamber for periodic collection of the particulate matter should have a cross-sectional area equal to a small fraction of the cross-sectional area of the downward portion of the flow path in order to minimize any possible updraft. The collection chamber should be closed for the same reason.

31744 APTIC NO. 53676

Pearson, Michael J., Orrie C. Olsen, and James F. Murphy

CATALYTIC CONVERSION OF ORGANIC SULFUR COMPONENTS OF INDUSTRIAL OFF-GASES. *(Kaiser Aluminum and Chemical Corp., Oakland, Calif.) U. S. Pat. 3,725,531. 6p., April 3, 1973. 2 refs. (Appl. Feb. 22, 1971, 10 claims).*

A process for the catalytic conversion of organic sulfur- containing components present in industrial off-gases to easily removable compounds has been developed employing an improved alumina base catalyst possessing increased resistance to sulfate poisoning and consequently extended service life. The catalyst consists of an alumina base support possessing a surface area in excess of about 10 sq m/g. The support is combined with at least one promoter selected from calcium, strontium, magnesium, zinc, cadmium, barium, and molybdenum such that the promoter is present in an amount at least equal to 0.1% by weight of the catalyst. The catalytic conversion of the organic sulfur components is accomplished at temperatures between about 100 C and 400 C and preferably between 200 C and 400 C. (Author summary modified)

31745 APTIC NO. 53620

Predikant, Hans H.

PROCESS FOR PURIFYING INDUSTRIAL WASTE GASES CONTAINING HYDROGEN FLUORIDE. *(Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,709,978. 4p., Jan. 9, 1973. 7 refs. (Appl. Nov. 9, 1970, 6 claims).*

A multi-stage, continuous process for scrubbing a waste gas stream containing such components as hydrogen fluoride, fluorine, sulfur dioxide, and aluminum dust generated during the production of aluminum from alumina has been developed for obtaining improved purities of the treated waste gases. The present method is capable of purification to a maximum content of hydrogen fluoride not exceeding 1 mg/N cu m. The waste gases are subjected to a first washing zone by means of a recycled aqueous hydrogen fluoride-containing solution and to a second washing zone by means of a recycled aqueous solution. Aqueous HF is transferred from the first washing zone to a neutralization zone where it is neutralized by means of aqueous sodium hydroxide or sodium carbonate. The sodium fluoride formed is separated, and the mother liquor is recycled as the first washing liquid. The aqueous HF for the first washing zone is enriched by recycling to a content of from 1.0 to 2.9% by weight, while the aqueous solution of the second washing zone is adjusted to maintain a content of from 0.01 to 0.5% by weight of free HF. The purpose of controlling the wash streams is to prevent too much HF from reaching the second stage where sodium fluoride would precipitate and block valves and piping. Treatment of the combined effluent from each wash stage in a neutralization zone accomplishes precipitation of sodium fluoride, sodium sulfate, and entrained dust or aluminum particulates.

31746 APTIC NO. 53869

Quillmann, Heinrich

POSSIBILITIES OF THERMAL AND CATALYTIC AFTERBURNING OF WASTE GASES AND LIQUIDS IN THE INDUSTRY. *(Moeglichkeiten der thermischen und katalytischen Verbrennung von Abgasen und Fluessigkeiten in der Industrie). Text in German. Chem. Ind. (Duesseldorf), 25(8):497-498, Aug. 1973.*

After reviewing the operating principles of both catalytic and thermal afterburning, examples of practical application of both methods are discussed. Catalytic afterburning is widely used in the chemical industry for cleaning the tail-gases from catalytic oxidation of naphthalene. Either solid metal catalysts are used for this or a layer of palladium-coated catalysts. The heat liberated through the oxidation process is used for pre-heating the process waste air required for oxidation. Waste water containing low-boiling solvents can be stripped with air, and the solvent-containing waste air is burned catalytically or thermally. With catalytic afterburning, the residual concentration of organically bound carbon amonunts to between 50 and 250 mg/cu m waste air. If the waste gases contain much nitrogen, thermal afterburning is more efficient. For catalytic afterburning of waste gases, the organic carbon concentration should not be higher then 3 g/cu m to avoid thermal overloading of the catalyst. The pollutant concentration should be constant and the waste gases must be free of dust and substances which leave solid residues after combustion.

31747 APTIC NO. 53880

Remick, Cassius D.

ELECTROSTATIC PRECIPITATOR. *(Electrohome Ltd., Kitchener, Ontario (Canada)) U. S. Pat. 3,727,380. 6p., April 17, 1973. 2 refs. (Appl Oct. 18, 1971, 7 claims).*

An electrostatic precipitator for removing particles such as dust, smoke, and pollen from a gaseous medium has been designed so that the construction of the collector plates and their supports do not require expensive equipment and complicated assembly. Identical printed-circuit boards are used at either end of a number of collector plates both to provide electrical connections and to space the plates. The plates have at either end a support tab and a contact tab, both of which register in slots in the respective printed circuit board. The boards have printed bus bars connecting the contact tabs of the plates with the same potential, and these bus bars are coated first with a conductive resilient coating and then with a resilient non-conductive coating. Dow-Corning Silastic 735

RTV is satisfactory for the first coating, and Dow-Corning 145 protective coating works well for the latter. (Author abstract modified)

31748 **APTIC NO. 53886**

Richardson, Harry L.

REMOVAL OF ENTRAINED MATTER FROM GAS STREAMS. *(Chemical Construction, New York) U. S. Pat. 3,729,898. 7p., May 1, 1973. 10 refs. (Appl. June 1, 1971, 13 claims).*

A modified venturi-type scrubber for the removal of submicron or colloidal particulate material from gas streams, such as solid or liquid fume generated by chemical plants, smelters, electric furnaces, basic oxygen steel furnaces, or the like, has been designed to greatly increase scrubbing efficiency and particulate removal. A high voltage electrostatic charge is provided on the scrubbing liquid being passed to the venturi scrubber to allow attraction and entrainment of the particulate material; the particulate may also be provided with an electrical charge (of opposite polarity) upstream of the venturi scrubber. A lower gas pressure drop may be provided in the venturi scrubber, and a lesser flow of scrubbing liquid is required to attain high scrubbing efficiency. The apparatus is relatively simple to fabricate and operates with low electric current consumption. Operation of a 1500 ACFM pilot unit treating the gases drawn from a typical electric furnace for the production of ferrosilicon resulted in efficiencies over 90% collection at 1/10th of the power required for operation of a conventional venturi scrubber.

31749 **APTIC NO. 53679**

Robison, Ernest B., Shelton Ehrlich, and John W. Bishop

PROCESS AND APPARATUS FOR BURNING SULFUR-CONTAINING FUELS. *(Dept. of Interior, Washington, D. C.) U. S. Pat. 3,717,700. 9p., Feb. 20, 1973. 3 refs. (Appl. Aug. 25, 1970, 19 claims).*

A process and apparatus for burning sulfur-containing fuels in a two-zone system are presented. Sulfur oxide acceptors, such as calcined limestone and dolomite, can be regenerated or forced to release sulfur dioxide within a fluidized bed combustion furnace operating in an oxidizing mode. The regeneration of a sulfur oxide acceptor can be carried out simultaneously with combustion and steam generation. Coal is burned within two-stage combustion zones in contact with the sulfur oxide acceptor. Non-combustible particulate material comprising the sulfur oxide acceptor circulates between these combustion zones and a regeneration zone while flue gas issuing from the combustion zones is segregated from that produced in the regeneration zone. The regeneration zone is operated at a higher temperature than are the combustion zones. Sulfur oxides absorbed in the combustion zones are released as sulfur dioxide in the higher temperature regeneration zone. As a result, flue gas issuing from the combustion zones is substantially depleted in sulfur oxides while flue gas exhausting from the regeneration zone is substantially enriched in sulfur dioxide. Designs of the apparatus are given.

31750 **APTIC NO. 53667**

Rowley, Harold A.

SCRUBBING APPARATUS FOR POLLUTED GASES. *(M. H. Detrick Co., Chicago, Ill.) U. S. Pat. 3,726,064. 8p., April 10, 1973. 9 refs. (Appl. June 3, 1970, 1 claim).*

A scrubbing apparatus for use with industrial furnaces, refuse incinerators, materials processing apparatuses, and the like has been designed to eliminate or minimize the discharge of gases containing insoluble and soluble pollutants and by-product materials of value. The device differs from the prior art in having crescent-shaped tanks with wetted concave wall surfaces for a liquid screen which also constitutes a damper. Operationally, the invention consists of screens of downwardly flowing liquid such as water in a flue between one or more gas sources and a point of discharge. Substantially all of the gases in the system impinge against or are exposed to liquid of the liquid screens as they travel along guided tortuous paths across the screens toward the point of discharge. Insoluble and soluble pollutants such as dust, liquid droplets, sulfur dioxide, sulfur trioxide, cobalt, and by-product materials in the gases are entrained or dissolved in the liquid and carried away by same. The remaining gases which are discharged (usually to the atmosphere) are comparatively free of objectionable pollutants and are at desirable temperature. (Author summary modified)

31751 **APTIC NO. 53581**

Sandhagen, Jurgen

EXHAUST GAS RETURN MEANS FOR INTERNAL COMBUSTION ENGINES. *(Volkswagenwerk A. G., Wolfsburg (Germany)) U. S. Pat. 3,713,428. 6p., Jan. 30, 1973. 5 refs. (Appl. March 10, 1971, 15 claims).*

An improved internal combustion engine intake system which includes an air metering element for feeding air or a mixture of fuel and air to the combustion chamber has been designed to reduce the undesirable components of exhaust discharged into the atmosphere by overcoming instability problems previously encountered with internal combustion engine systems having an exhaust gas recirculating means. An exhaust gas passage recirculates exhaust gas from the exhaust line back into the combustion chamber together with the incoming air. The flow of exhaust gas through the passage is under the control of a shutoff valve with an operating mechanism that responds to differences between the pressure prevailing within the intake system and the pressure in the region of the metering element or throttle valve. Thus, the shutoff valve is opened only during certian predetermined load conditions of the engine. The invention can also be used advantageously with other types of engines, e.g., stationary engines and is by no means limited to use with carburetor equipped engines. (Author abstract modified)

31752 **APTIC NO. 53794**

Scheers, A. H.

SAFETY SYSTEMS AND AIR POLLUTION. 10. 6: FLUID SEPARATORS. *(Veiligheidssystemen en luchtverontreiniging. 10. 6: vloeistofafscheiders). Text in Dutch. Polytech. Tijdschr., Ed. Procestechniek (The Hague), 28(15):485-494, July 1973.*

Design and operating problems of knock-out drums, used as liquid separators in torch (flare) pipes, are described on the bases of different design methods. To prevent eruptions, liquid particles, especially those larger than 150 micron, have to be separated before the gases to be burned reach the pipe in many cases. The diameter of knock-out drums should be designed for slow gas flow to allow time for the liquid droplets carried by the gas to separate. Also, knock-out drums should be provided with liquid level-controlled, automatic drain-off pumps. The comparison of the Rearick, S. H. Tan, American Petroleum Institute, the simplified general method, and the general method for the dimensioning of single-flow knock-out drum diameters shows the superiority of the API method over the others.

31753 **APTIC NO. 53675**

Schulze, Gerhard and Wolfgang Heck

PROCESS FOR THE OXIDATION OF HYDROGEN SULFIDE TO ELEMENTARY SULFIDE TO ELEMENTARY SULFUR. *(Badische Anilin-Soda-Fabrik A. G., Ludwigshafen/Rhine (West Germany)) U. S. Pat. 3,725,537. 4p., April 3, 1973. 5 refs. (Appl. Feb. 19, 1971, 8 claims).*

A process for the oxidation of hydrogen sulfide with oxygen or sulfur dioxide in the presence of a solvent to form sulfur has been achieved in the presence of a triamide of orthophosphoric acid having the general formula OPN3(R2)3, where R denotes a hydrogen atom and/or an alkyl group having up to three carbon atoms and where at least three alkyl groups are required. The process overcomes shortcomings of the prior art such as poor reaction, formation of contaminated sulfur, volatility and decomposability of the solvent and/or catalyst, and toxicity of arsenic-containing solutions. Triamides having six alkyl groups are preferred to those having three alkyl groups; for example, hexamethyl phosphoric acid triamide, mixed with 0.1 to 70% by weight of water, exhibits very good properties. Particularly suitable diluents are polar, aprotic solvents whose dielectric constant is at least 20 and whose boiling point is at least 150 C at atmospheric pressure. It is also advantageous to use diluents which have good solvency for H2S or SO2, i.e., those whose Bunsen absorption coefficient is at least 95 for SO2, and 30 for H2S. Examples of suitable diluents are nitriles such as benzonitrile, ethylene carbonate, propylene carbonate, and tetramethylene sulfone. The concentration of the phosphoric acid triamide in the mixture should be at least 5% and preferably 10% by weight. The process is suitable for the complete desulfurization of gases or gas mixtures whose hydrogen sulfide content may vary substantially and may be carried out industrially in various ways.

31754 **APTIC NO. 53815**

Seetharamamurty, D. V. and M. Ramanujam

CONTROL OF PARTICULATE AIR POLLUTION. *Chem. Age India, 24(4): 217-223, April 1973. 3 refs.*

Four main types of dust collection equipment used in the process industries are described, and guidelines for choosing the equipment are presented. Dry inertial collectors are based on the operation of solid particles due to the difference in motion under gravity or inertia or a combination of these against the motion of the gas stream. Examples include settling chambers, baffle chambers, cyclones, and multiple cyclones. Wet scrubbers involve the principle of washing the dirty gas with a suitable medium, usually water. Examples include gravity spray, centrifugal, impingement, packed bed, jet, and venturi. Fabric filters make use of the principle of direct filtration of the dirty gas by passing it through a filter medium which is usually a bag or an envelope with woven or felted fabric made of natural or synthetic fibers. In electrostatic precipitators, the gas between a high voltage electrode and a grounded electrode is ionized. The dust particles which are in suspension are charged by the gas ions and migrate to the grounded collecting electrode. The solid particles so deposited are removed by rapping with hammers or vibrators. If mists are precipitated, they run off the collecting surface. The choice of method of controlling air pollution depends on the characteristics of the particulates to be collected, the characteristics of the gas, and nature of the effluent desired. The overall cost factor which includes the equipment costs, and the operating costs, has to be taken into account while judging the economy of any dust collection problems.

31755 **APTIC NO. 53838**

Sendai, Kazuhiko and Akio Suzuki

ELECTROSTATIC PRECIPITATOR. *(IHI-shiki denki shujin sochi no gaiyo). Text in Japanese. (Ishikawajima Harima Giho (Ishikawajima- Harima Eng. Rev.), no. 5:72-77, May 1973. 1 ref.*

The principles, structure, and mechanism of an electrostatic precipitator, which was developed mainly for ceramic industries, are discussed. The mechanical strength is superior and the use of corrosion-resistant electric lines prevent breakdowns due to corrosion. When dust particles are small and the gas contains a high rate of dusts, an ordinary precipitator's dust collection rate decreases because of the space electric charge and inhibition of corona current. This precipitator uses special lines for the electrodes, and effective and stable discharge is maintained. Special consideration is made for heat expansion, and electrodes are maintained at a stable distance in spite of the high temperature; therefore the treatment of high temperature gas is possible. Consumption of electricity if minimal, maintenance is easy, and automation makes no-man operation possible. The flow distribution in the system is even and uniform, and the pressure loss is only 10-20 mm Aq. When treating high temperature gas and high temperature dust, a superior humidity adjuster can be installed, and the collection rate can be economically and effectively increased. Rapping is used to clean the electrodes of collected dust.

31756 **APTIC NO. 53885**

Seymour, James E.

PROCESS FOR REDUCING EMISSION OF DUST BY GRANULAR FERTILIZER COMPOSITIONS. *(Royster Co., Norfolk, Va.) U. S. Pat. 3,734,707. 5p., May 22, 1973. 4 refs. (Appl. Oct. 22, 1970, 22 claims).*

An improved process for manufacturing granular fertilizers which emits substantially less airborne dust upon handling, transport, and use has been developed. The process consists of spraying the fertilizer granules with an aqueous solution of a nitrogen containing salt at the output end of the cooler for the furnace dried product. Best results are obtained when only the size classified fraction of the heat-dried product enters the cooler feed to attain maximum coverage of the granule surface by the spray solution. The aqueous solution spray bonds the fine, dust-like fertilizer particles in the cooled product stream to one another and to relatively larger particles and thus serves to agglomerate fertilizer dust particles with the formation, in turn, of agglomerates having increased density, greater projected surface area, or both. The agglomeration results in substantial reduction in the amount of fertilizer dust becoming airborne upon handling, transport, and use; hence, atmospheric pollution is reduced. Concomitantly, the aqueous spray solution adds plant food value to the fertilizer compositions. (Author summary modified)

31757 **APTIC NO. 53664**

Shigaki, Masanobu, Shigehiro Kido, and Yoshikazu Chiba

HYDROGEN CHLORIDE RECOVERY INCINERATOR FOR PLASTICS CONTAINING HYDROGEN AND CHLORINE. *(Takuma Kikan Mfg., Co., Osaka (Japan)) U. S. Pat. 3,716,339. 5p., Feb. 13, 1973. 5 refs. (Appl. Dec. 14, 1970, 4 claims).*

A plastic waste incinerating apparatus for the disposal of scrap vinyl polymer chlorides such as polyvinyl chloride and polyvinylidene chloride has been designed for the recovery of hydrogen chloride for subsequent use and the attainment of a relatively pollution-free discharge. Scrap polymers are partially decompsed by heat to free themselves of chlorine which excapes for the most part as hydrogen chloride and is recovered in a confined space. The scrap, partially decomposed polymer is subsequently crushed and discharged onto a grate of a furnace which is subjected to a current of air that is in excess to that required for complete combustion of the scrap. Fines and fly ash arising from the combustion together with the gases of combustion in which they are entrained are directed through a passage where the hot gases contact a heat exchanger. After the hot gases of combustion and particles of solid materials entrained therewith have been discharged past the heat exchanger, they are subjected to a dust collector to remove the fines and fly ash. The gases of combustion are subsequently discharged to the ambient atmosphere through a chimney primarily as carbon dioxide.

31758 **APTIC NO. 53875**

Shirasawa, Tadao

ABATEMENT OF AIR POLLUTION CAUSED BY FLUORIDE AND PROBLEMS. *(Fussokagobutsu no jokyo to sono mondaiten). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(4):367-373, April 1973.*

Emission standards, removal and recovery methods, and measurement methods for fluorides emitted from an aluminum

smelter are discussed. In Japan there are two emission standards for fluorides: the weight concentration standard (mg/cu m) and the total amount standard. Since the weight concentration can be easily lowered by diluting the air, the total amount is a more effective standard. A dust collector and a scrubber are usually used for collection of particulate and gaseous fluoride, respectively. A combination of these methods gives more effectiveness. Corrosion of collection equipment must be avoided during removal of hydrogen fluoride. Calcium hydroxide, sodium hydroxide, sodium sulfate, and limestone can be used to absorb HF.

31759 **APTIC NO. 53606**

Spindeler, Heinrich

POLLUTION FREE COKE QUENCHING CAR. *(Dr. C. Otto and Co., G.m.b.H, Bochum (West Germany)) U. S. Pat. 3,721,609. 5p., March 20, 1973. 8 refs. (Appl. May 6, 1971, 8 claims).*

A coke quenching car which is movable along a battery of horizontal coke ovens has been developed to eliminate smoke and dust pollution. The car has a pair of spaced vertical walls which extend transversely and define a fall space between them. The upper part of this space has a front opening for receiving coke from an oven. The space below the opening is closed by a front wall, while the back of the fall space is closed by a back wall. A ramp of equal diameter to the fall space extends from the bottom of the opening rearwardly in the fall space and part way across the car. A deck slopes down from the back wall below the inner end of the ramp for receiving coke from it and discharging it beneath the ramp onto a floor that slopes from the front wall in a downward direction to the back wall. The lower part of the back wall has an outlet opening that normally is closed by a door. Water sprays for quenching coke beneath them are located in the upper portion of the fall space and below the ramp and deck. (Author abstract modified)

31760 **APTIC NO. 53888**

Stone, Raymond E. and Aubrey E. Wing

CONTROL SYSTEM FOR A WASTE WOOD BURNER. *(Industrial Construction Co., Ltd., Eugene, Oreg.) U. S. Pat. 3,730,114. 9p., May 1, 1973. 3 refs. (Appl. Feb. 28, 1972, 8 claims).*

A control system for the continuous regulation of a waste wood burner system has been designed for sequential ignition and controlled burning at a temperature that insures complete combustion with limited smoke emission from the burner. Typical start-up operation involves closure of the damper doors at the tip of the burner with simultaneous enervation of an underfire system blower to provide an air flow to the base of the waste pile. When the collection of waste material is such as to cover the underfire air outlets, the igniters are activated and remain on until such time as the burner temperature reaches 800 F; the igniters are then shut down while simultaneously overfire blowers are started. The damper doors initiate opening at a temperature of 950 F, while the air flow from the underfire blower and igniter-blower is greatly reduced. Normally, during burner operation the temperature will recede below 900 F at which time the damper doors will initiate closing. Dropping of the burner temperature below 900 F will jointly cause automatic operation of the damper doors along with full operation of the underfire system. A temperature probe is located approximately 3 ft below a damper door opening for determining burner temperature. (Author summary modified)

31761 **APTIC NO. 53836**

Stuehmer, Karl-Heinz

THE USE OF REFINERY GASES FOR THE PRODUCTION OF FERTILIZER. *(Dei Einsatz von Raffineriegasen zur Erzeugung von Duengemitteln). Text in German. Chem. Tech. (Berlin), 25(8):461-462, Aug. 1973. 1 ref.*

In the fertilizer production plant VEB PCK Schwedt, East Germany, two refinery gases, which are usually burned in a flare, are used to produce fertilizer. The first gas is diesel fuel surplus gas which develops in the reforming plants and at the production of aromatics. The largest part of this gas is used for the refining of diesel fuel. It contains hydrogen sulfide which is removed through scrubbing with sodium lye prior to its use in the steam reforming process. The second gas develops at the dissociation of liquid gas for the production of propane, n-butane, and isobutane as noncondensable gas. Since the two gases vary widely in their composition, a third gas, n-butane, is usually added for the production of ammonia. The C to H ratio in the initial gas fluctuates between 3.2 and 4.2 In order to keep the ammonia production constant, the personnel must be able to interfere with the various process states, and the use of a computer is justified.

31762 **APTIC NO. 53616**

Sved, John R.

GAS SCRUBBER. *(Pollution Rectifiers Corp., New York) U. S. Pat. 3,710,551. 7p., Jan. 16, 1973. 12 refs. (Appl. June 18, 1970, 9 claims).*

A dust and fume scrubber-type collector has been designed to remove pollutants from an air stream without imposing restrictions upon the rate of flow of the air stream. The device does not require water sprays and has an essentially self adjusting inlet passageway which maintains a generally constant velocity of the gases despite variations in volume of incinerator gases drawn through it. It can be used with gases of elevated temperatures and can cool the gases as well as clean them. A number of spaced straight and curved baffles are positioned to direct incoming dirty air over a water reservoir at velocities sufficiently high to enable the dirty air to entrain multitudes of water droplets. The water droplets are then thoroughly mixed with the contaminated air, and the solid pollutants are completely wetted. The wet solid pollutants, being relatively heavy, are deflected downward through the action of the baffles and the reduced air velocities into the water reservoir. A constant volume air control means is disposed between the chamber and the source of polluted air and contains primary and secondary air inlet ducts with a damper controlling the air through each duct. The dampers of the two ducts are coupled to operate complementary to each other in order to provide a constant air flow to the chamber for various flows of polluted air directed to the scrubber through the primary air inlet duct. The scrubber is economical to build, reliable in operation, and has no moving parts. (Author abstract modified)

31763 **APTIC NO. 53909**

Tamaru, Tadayoshi

VENTRI-SPHERE WET SCRUBBER. *(Benchuri sufea sukuraba no gaiyo). Text in Japanese. Ishikawajima Harima Giho (Ishikawajima-Harima Eng. Rev.), no. 5:66-71, May 1973.*

A Ventri-Sphere Wet Scrubber was developed from a TCA (Turbulent Contact Absorber) and venturi scrubber. Dust containing gas enters into the venturi pipe and the flow is accelerated at the throat portion where the absorbent fluid pours into it. The liquid is atomized by the high speed (60 m/sec 100 m/sec) of the gas and collides into dusts, instantly capturing them. The liquid particles which contain dusts pass through the diffuser and enter the lower space; most particles are collected there. The gas changes direction and goes upward through a bed packed with light weight balls between two grids. Since the balls are packed 1/5th of the height of the space between grids, they move, creating turbulence, mixing the gas and liquid. Almost all dust containing mist is captured here. Then moves onto the mist eliminater and goes out from the upper exhaust outlet. The mist eliminator is a fixed-vane centrifugal type. This system captures submicron particles effectively and the rate of both dust collection and gas absorption is superior. The structure is compact, and liquid slurry can be used as an absorbent. The liquid is not sprayed at the

throat portion, therefore creating no clogging of the nozzles. The balls in the bed have self-cleaning action, and there is minimal pressure loss. The operation is very economical. The mechanism of dust collection and various applications of this scrubber are described.

31764 **APTIC NO. 53618**

Tarhan, Mehmet Orhan

GAS DESULFURIZATION PROCESS. *(Bethlehem Steel Corp., Bethlehem, Pa.) U. S. Pat. 3,709,976. 6p., Jan. 9, 1973. 6 refs. (Appl. Sept. 21, 1970, 4 claims).*

An absorption-desorption method for removing and processing acid gas contaminants such as hydrogen sulfide and hydrogen cyanide from industrial gases, particularly those resulting from the carbonization of coal, overcomes the objectionable discharge of sulfur dioxide into the atmosphere and avoids discharging contaminated steam condensate into streams. The industrial gases are subjected to a vacuum induced by a steam-jet process and are then reacted in a Claus process to produce elemental sulfur. The acid gas-contaminated steam condensate obtained as a by-product from the steam-jet vacuum process is decontaminated in a separate condensate stripper, and the acid gases removed from the condensate are reintroduced into the main desorbed acid gas stream. The heat produced from the Claus process is utilized, by heat exchange, to provide heat for the desorbing of the acid gases and for the stripping of acid gas-contaminated condensate. Thus, the present method provides a continuous, heat-balanced process not inherent in prior art gas desulfurizing processes. (Author abstract modified)

31765 **APTIC NO. 53741**

Teeuwen, T.

COMBINED TREATMENT OF WATER-TREATMENT SLUDGE AND SOLID WASTE. *Ber. Abwassertech. Ver., no. 26:301-315, 1973. 4 refs.*

Composting, controlled tipping, and incineration of solid waste mixed with sewage sludge is discussed. Incineration of the two waste products produces aggressive off-gases which can be liberated from dust and other pollutants in electrostatic precipitators after cooling to 300 C or in scrubbers. With the latter method corrosion problems occur. Operation of the rotary kiln with non-dried sludge and solid pulverized waste as well as with dried sludge is discussed. In the latter case the heat from the flue gases is used for sludge drying. An entirely different method which is being tested in several plants is the injection of atomized fluid sludge into the flue gases of the incinerator. This helps to cool the flue gases from about 950 to 750 C. For further cooling water is injected. With this method about 0.5 tons of sludge (five percent dry substance) for each ton of solid waste can be disposed of.

31766 **APTIC NO. 53603**

Teller, Aaron J.

PROCESS FOR RECOVERY OF ACID GASES. *(Teller Environmental Systems, Inc., New York) U. S. Pat. 3,721,066. 4p., March 20, 1973. 4 refs. (Appl. Dec. 29, 1970, 10 claims).*

A process for the removal and recovery of acid gas components such as hydrogen fluoride, silicon tetrafluoride, and sulfur dioxide from waste gases produced in the manufacture of glass, fertilizer, or aluminum during electrolysis is accomplished by passing the gases over a finely divided natural ore known as nepheline syenite. The nepheline syenite is desirably in the form of particles ranging in size from 4 to 500 mesh. Particles are preferably 200 to 325 mesh for bag filters, 6 to 14 mesh for fixed or moving bed applications, and 200 to 500 mesh for pipeline reactions. The sorbant properties of the nepheline syenite can be substantially improved by treating the syenite with 10 to 50 lbs of water per 100 lbs of syenite at ambient conditions. The finely divided nepheline syenite may be employed in the form of a fixed or a moving or a fluidized bed through which a stream of gas containing the acid components is passed. The gases desirably pass through the bed at a temperature of 100 to 400 F and preferably from 100 to 200 F. The space velocity of the gas should range from 100 to 10,000,000/hr and preferably from 10,000 to 1,000,000/hr. The preferred process temperatures and space velocities depend upon the concentration of the acid gases, the thickness of the bed of sorbing medium, the average particle size of the sorbing medium, and the amount of acid gases already sorbed.

31767 **APTIC NO. 53922**

Theodore, Louis, Joseph P. Reynolds, and Ralph J. Navarrete

RESULTS OF A NEW TECHNIQUE FOR CALCULATING COLLECTION EFFICIENCIES IN ELECTROSTATIC PRECIPITATORS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 30p., 1973. 13 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-292.)*

Results of a new technique for calculating collection efficiencies of several system variables is presented. The variables include particle size distribution, particle mass flow rate, gradient, gas velocity profile, and the variation of electrostatic force as a function of particle size and inlet position. The calculated results for collection efficiencies are in reasonable agreement with the limited experimental data available in the literature. Variation of precipitator geometry and electrostatic force produce results that are in qualitative agreement with what one would expect, and for a given efficiency, the drift velocity in the model differs considerably from that calculated by the Deutsch Anderson method. A substantial difference is found between collection efficiencies that are calculated using particles of a single characteristic size and those calculated assuming a distribution of sizes. Because it employs a random assignment of inlet position, size, and charge to each particle being tested, the proposed method of solution is more akin to physical experimentation than analytical or numerical methods, and as such should provide a realistic approach to both the calculation of collection efficiencies and the design of electrostatic precipitators. (Author abstract modified)

31768 **APTIC NO. 53914**

Thornburgh, William F.

INTAKE MANIFOLD FOR EXHAUST GAS RECIRCULATION AND METHOD OF MANUFACTURE. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,717,130. 9p., Feb. 20, 1973. 3 refs. (Appl. Oct. 14, 1971, 3 claims).*

An intake manifold for exhaust gas recirculation in a V-8 type internal combustion engine has been designed with an exhaust gas recirculation passage and a means for receiving a control valve assembly in a manner which is substantially easier to manufacture than prior art structures. The device also includes a novel port structure formed by matching operations which may be combined with those usually conducted on other intake manifolds. The present manifold unit has induction, exhaust gas crossover, and exhaust gas recirculation passages cast in an integral unit. The exhaust gas flowing through the crossover passage heats the induction passages, and the exhaust drawn from the crossover passage through the recirculation passage is metered by a control valve and introduced into the induction passages.

31769 **APTIC NO. 53623**

Tomlinson, Norfleet

POLLUTION-REDUCING FUEL FILTER. *(Assignee not given.) U. S. Pat. 3,724,429. 5p., April 3, 1973. 9 refs. (Appl. Nov. 16, 1970, 4 claims).*

A novel, highly effective pollution-reducing fuel filter for incorporation in the fuel supply system of an internal combustion engine has been designed such that it avoids interference with the normal fuel flow to the carburetor and smooths out pulses in the flow which otherwise might exist. The invention utilizes a one-piece plastic container having vertical spaced fuel inlet and outlet openings and is adapted to the filled with water to a level between these openings. The lower inlet opening is connected to a line leading to the fuel pump, and the upper outlet opening is connected to the carburetor. A closed air compartment is located above the outlet opening for holding a captive body of compressed air forming a cushion which resists movement of the fuel above the normal fuel level adjacent the outlet opening. The gasoline, in passing through the fuel filter, is bubbled through a liquid layer composed primarily of water and a slight amount of soluble oil and is washed to remove suspended impurities. A slight amount of water is carried with the gasoline through the carburetor and into the intake manifold. A refill opening is provided in the air compartment and is covered by a closure cap which resists vibrational loosening.

31770 **APTIC NO. 53622**

Tonnessen, Tonnes K.

NONPOLLUTING ENGINE. *(Assignee not given.) U. S. Pat. 3,724,432. 8p., April 3, 1973. 2 refs. (Appl. June 3, 1971, 10 claims).*

A nonpolluting, low-emission, two-cycle diesel crosshead engine has been designed with an engine air system for supplying clean, cooled air to reduce engine exhaust emissions. The air chamber has a fluid pump providing an expandible interior volume to accommodate clean air displaced from the cylinder on the power stroke of the piston. A floating pump piston in the air chamber is urged toward the lower end of the chamber to intermittently force a clean, relatively cool charge of air into the cylinder for scavenging the smoke, particulates, fumes, and other exhaust emissions and for supplying a clean air charge for compression. A piston lifter is adapted to return the pump piston to its initial position during the compression stroke of the piston; simultaneously, suction valves open to admit cooled and/or filtered air at atmospheric pressure into the air chamber and cylinder. A valve bypass conduit connects the cylinder and the independent air chamber to provide means for regulating the air pressure acting on the floating pump piston and to adjust the movement for particular operating conditions of the engine. (Author abstract modified)

31771 **APTIC NO. 53578**

Toorn, Lambertus J. van der, Jacobus S. Ouwerkerk, and Jakob van Klinken

RESIDUAL OIL. *(Shell Oil Co., New York) U. S. Pat. 3,714,031. 10p., Jan. 30, 1973. 1 ref. (Appl. Nov. 18, 1970, 10 claims).*

A direct hydrodesulfurization process has been developed in which a residual oil remains substantially in the liquid phase which comprises dissolved hydrogen sulfide and/or a sulfur compound, both being readily convertable to hydrogen sulfide. The hydrodesulfurization occurs over a fixed catalyst bed of the solid sulfur-resistant type. An external product recycle of at least three volumes of desulfurized product per volume of residual oil is applied with the recycle stream having a hydrogen sulfide content of at least 0.05% weight. Although the most important application of the process is catalytic hydrodesulfurization of residual hydrocarbon oils, the process may also be used for other catalytic hydroconversions of residual oils such as hydrocracking for the production of HVI lubricating base oils from long or short residues. (Author abstract modified)

31772 **APTIC NO. 53601**

Tourtellotte, John F.

APPARATUS FOR REMOVING HYDROCARBONS FROM A GAS STREAM. *(Chemical Construction Corporation, New York) U. S. Pat. 3,722,189. 7p., March 27, 1973. 5 refs. (Appl. May 24, 1971, 16 claims).*

A fluid-solid contactor apparatus has been designed for specific application to the treatment of internal combustion engine exhaust gas containing relatively large proportions of unburned or thermally degraded hydrocarbons. The relatively cold gaseous mixture of engine exhaust gas produced during the first few minutes of startup (time of highest pollutant concentrations) is passed through a bed of discrete solid particles of a suitable absorbent agent which selectively absorbs the hydrocarbon vapor so that the residual gaseous phase may be safely discharged to the atmosphere without causing air pollution. The absorbent bed may become laden with absorbed hydrocarbon during this initial period of 1-10 min, depending upon the atmospheric or initial engine temperature or engine type. Subsequent desorption can be accomplished by passing a small stream of hot exhaust gas through the bed and recycling the resulting exhaust gas-hydrocarbon vapor mixture to the engine intake appurtenances. (Author summary modified)

31773 **APTIC NO. 53878**

Ventriglio, Frank J., David M. Zall, Cyril J. Stockhausen, and Donald R. Decker, Jr.

CARBON DIOXIDE SORBENT FOR CONFINED BREATHING ATMOSPHERES. *(Assignee not given.) U. S. Pat. 3,729,902. 7p., May 1, 1973. 7 refs. (Appl. April 21, 1971, 3 claims).*

An improved material for effecting adsorption of carbon dioxide from confined breathing atmospheres and for regenerating the spent CO_2 sorbent material will achieve the 0.5% CO_2 concentration requirement for ecological atmospheres. The new CO_2 sorbent is based on the concept of distributing potassium carbonate on an adsorbent material possessing a large surface area per unit volume. The sorbent is made by treating a synthetic zeolite material (as for example, 10A., 8-12 mesh Molecular Sieve No. 544) with an aqueous solution of K_2CO_3. The treatment consists of adding the aqueous K_2CO_3 solution to the dry molecular sieve and allowing the ensuing reaction to proceed to completion. The excess solution is then decanted, and the resultant reaction product is dried at 280 F. The new treated sieve sorbent not only possesses a CO_2 sorption capacity greater than the impregnated carbon type but also is stable under rigorous regeneration conditions.

31774 **APTIC NO. 53619**

Villiers-Fisher, John F.

REMOVAL OF SO_2 FROM GAS STREAMS. *(Chemical Construction Corp., New York) U. S. Pat. 3,709,977. 5p., Jan. 9, 1973. 7 refs. (Appl. Nov. 16, 1970, 6 claims).*

An improved process for the removal of sulfur oxides from a gas stream containing sulfur dioxide and sulfur trioxide results in an essentially pollution-free gas stream which may be safely discharged to the atmosphere. The process basically entails the adsorption of the sulfur dioxide on a solid basic ion exchange resin, and the prevention of a premature decrease in resin activity or resin inactivation by first contacting the gas stream with an alkali to remove sulfur trioxide. Suitable agents for this purpose are calcium oxide, calcium hydroxide, calcium carbonate, magnesium oxide, magnesium carbonate, sodium hydroxide, sodium carbonate, potassium hydroxide, and potassium carbonate. The substantially free sulfur trioxide stream is contacted with a solid basic ion exchange resin at a temperature in the range of 25 to 45 C. The resin is regenerated by terminating the gas stream flow and contacting the resin with a stream of air which is free of water vapor and which is at an initial temperature of 80 to 130 C. A cross-linked organic polymer containing amine groups serves as the ion exchange resin in the process.

31775 **APTIC NO. 53604**

Vincent, Dan B.

GAS STREAM SCRUBBER. *(Assignee not given.) U. S. Pat. 3,721,068. 5p., March 20, 1973. 5 refs. (Appl. Feb. 1, 1972, 4 claims).*

A wet countercurrent gas stream scrubber has been developed for removing particles such as fish solids, citrus pulp, and other dust particles or syrupy droplets from exhaust gases of a dryer or the like. The system includes a vessel provided with coaxially interdigitated upper and lower baffles which control a countercurrent flow of the washing liquid and gas stream. The baffles are of graduating heights, and the upper set floats at a level determined by the pressure within the vessel. The device is self-cleaning to the extent that the washing liquid with entrained gas assists in cleaning the baffles; cleaning ports may also be provided. The control of gas and liquid streams may be accomplished by a standard sensing means, assisted, if necessary, by manual control via observation of the vessel interior through means such as a sight glass. The liquid inflow is normally maintained at such a rate that considerable turbulence exists in the liquid and that the liquid cascades over the radially outermost and intermediate of the lower baffles to reach the compartment between the radially innermost and intermediate lower baffles from which it drains at the bottom. (Author abstract modified)

31776 **APTIC NO. 53856**

Wakabayashi, Katsuhiko

THE ACTIVITY OF THE HYDRODESULFURIZATION CATALYSTS CONTAINING MOLYBDENUM. *(Moributen suisoka datsuryu shokubai no kassei ni tsuite). Text in Japanese. Sekiyu Gakkai-shi (J. Japan Petroleum Inst., Tokyo), 16(8):651-657, Aug. 1973. 43 refs.*

Physical and chemical factors influencing the activity of molybdenum hydrodesulfurization catalyst are described. The addition of cobalt or nickel and a gamma-alumina support are necessary for the Mo catalyst to exhibit its full catalytic activity. Pretreatment conditions affect the catalytic activity because of the formation of different complex oxides. The presence of free molybdenum oxide in an octahedral structure and the ability of Co and Ni to form octahedral structured molybdenate are closely related to the activity of the catalyst. Factors such as specific surface area, micropore distribution, and micropore volume also affect desulfurization activity. Deposition of carbon, vanadium, and Ni contained in heavy oil is responsible for a decrease in catalytic activity. Closing of the micropores also decreases catalytic activity.

31777 **APTIC NO. 53610**

Wallace, Richard A.

CONTINUOUS ELECTROMIGRATION PROCESS FOR REMOVAL OF GASEOUS CONTAMINANTS FROM THE ATMOSPHERE AND APPARATUS. *(Assignee not given.) U. S. Pat. 3,712,025. 7p., Jan. 23, 1973. 20 refs. (Appl. March 30, 1970. 19 claims).*

An electrolytic method for removing gaseous contaminants, particularly carbon dioxide, from the atmosphere consists of subjecting the gaseous contaminant laden atmosphere to contact with a strongly basic ionic polymer sheet under the influence of an applied electrical field. This electromigration process overcomes the difficulties of CO2 scrubbers presently in use which employ a modified monethanol amine (MEA) solution as the CO2 absorbent; hence, contamination of the atmosphere by ammonia, a degradation product of MEA, frequent mechanical repairs, and large volume and space requirements do not exist with the present invention. The apparatus consists of, at least one, and preferably several, sheets of strongly basic ionic polymeric material partially suspended at the lower end in a circulating stream of sea water (or brackish water). The polymer sheets in turn are interspersed between a source of an electrical field (approximately 200 volts potential difference); and a cation-exchange membrane and anion-exchange membrane are likewise interspersed between the cathode and upper exposed ends of the polymer sheets. Continuous removal of CO2 in the form of bicarbonate and of trace amounts (up to 50 ppm) of other acidic gaseous air contaminants such as nitrogen dioxide, sulfur dioxide, and hydrogen sulfide can be accomplished particularly well, for example, in submarine breathing atmospheres. The device is also particularly suitable in such CO2 atmospheres as mines and ships.

31778 **APTIC NO. 53839**

Watanabe, Tasuku

GAS CLEANING EQUIPMENT FOR PIG IRON AND STEEL MAKING PLANTS. *(Seitetsu seiko setsubiyo shujin sochi no gaiyo). Text in Japanese. Ishikawajima Harima Giho (Ishikawajima-Harima Eng. Rev.), no. 5:78-83, May 1973.*

Various dust collection systems for pig iron and steel plants are discussed. For a blast furnace, the combination of a dust catcher, a venturi scrubber, and a wet electrostatic precipitator, or the combination of a dust collector and two venturi scrubbers is used. The dust collection in electric furnaces is difficult, for the quantity of gas is large, the temperature is high, the quantity of gas and temperature fluctuate frequently, carbon monoxide content in the gas is high, and dusts are highly hygroscopic. The direct suction dust collection system consists of a fume collector, a gas cooler, and a dust collector (bag filter). The principles, structure, mechanism of equipment, and efficiency are discussed.

31779 **APTIC NO. 53657**

Waters, Ernest

ANTI-POLLUTION DEVICE. *(Assignee not given.) U. S. Pat. 3,717,979. 4p., Feb. 27, 1973. 4 refs. (Appl. May 3, 1971, 4 claims).*

An anti-pollution device which can be attached to the existing dual exhaust pipes of a motor vehicle for the reduction of harmful combustion particles includes a draft inducing means which forces the exhaust gases to remain within the filter media for longer periods of time, thereby causing more impurities to be absorbed. Operationally, the exhaust fumes pass through a water bath which removes all soluble impurities. The remaining impurities pass into the filter media contained in a pair of vertical tubes and are retained for a period of time during which a substantial portion of the non-soluble impurities are removed. The impurities are passed out the exhaust pipes integral with the vertical tubes. The major force in retaining the gases for a sufficient time in the filter media is accomplished by the action of an air actuated propeller and its associated vertical extension. The extension has blades which tend to constantly mix the filter media and circulate the gases for more removal of impurities.

31780 **APTIC NO. 53859**

Webster, Harold F. and N. Rey Whetten

AIR FILTER UTILIZING SPACE TRAPPING OF CHARGED PARTICLES. *(General Electric Co., Schenectady, N. Y.) U. S. Pat. 3,739,552. 9p., June 19, 1973. 5 refs. (Appl. Dec. 1, 1971, 26 claims).*

An air filter utilizing space trapping of charged particles uses two dimensional multipolar A.C. electrodynamic fields to trap particles charged by a high voltage D.C. source as they enter the apparatus in gas laden form. The particular order of multipolar fields which are generated is determined by the particular orientation and electrical connections of the conductors. The orientation of the air flow relative to the angular position of the planar arrays of conductors causes the particles to be directed to the side of a duct from which they can be removed. Trapping is enhanced by coating the conductors with a high dielectric strength material which permits operation at a higher A.C. voltage; the A.C. voltage may be sufficiently high to produce a corona discharge and obviate the need for a high voltage D.C. source. The filter is especially well suited for removing particles in the size range of 0.01 to 100 micron diameter, and larger sized particles may be removed by increasing the amplitude of the A.C. voltage or decreasing the spacing between the conductors which generate the multipolar fields. The A.C. potential may range from 0.5 to 50 kilovolts at a frequency of 60 Hz.

31781 APTIC NO. 53879

Wellman, Donald C.

ELECTROSTATIC AIR CLEANING APPARATUS. *(Carrier Corp., Syracuse, N. Y.) U. S. Pat. 3,735,560. 6p., May 29, 1973. 12 refs. (Appl. Aug. 5, 1968, 3 claims).*

An electrostatic air cleaning apparatus has been developed which utilizes a media type charged particle collector. The ionizer design includes ionizer wires spaced between elongated U-shaped metallic channels, with the web portion of the channel serving to block or restrict passing air. The wires centered in the spaces are connected to a power source to create an electrostatic field between the wire and the adjacent channel legs which are grounded. Satisfactory particle ionization within limits of a current draw of less than 5 ma and a voltage less than 6500 volts may be obtained over a greater range of air flow velocity and structural unit dimensions than with other types of construction. The ionizer may be enlarged to maintain minimum thickness of the cleaner without sacrificing either performance or safety when the size of the cleaner is varied by enlarging the dimensions of the collector.

31782 APTIC NO. 53862

Whetten, N. Rey and Harold F. Webster

AIR FILTER UTILIZING ALTERNATING CURRENT ELECTRIC FIELDS. *(General Electric Co., Schenectady, N. Y.) U. S. Pat. 3,739,554. 9p., June 19, 1973. 6 refs. (Appl. Dec. 1, 1971, 25 claims).*

An air filter which is suitable as an adjunct to room air conditioners has been designed to trap particles in space rather than on the surface of an electrode. Several electrical conductors distributed across a duct through which air flow is admitted are connected to a source of high voltage D.C. potential (10 to 20 Kv) for providing a corona discharge which charges particles in the nearby passing air stream. Several plate members fabricated of electrically conductive material are positioned downstream in the duct and are oriented parallel to the axis of air flow. The plate members are provided with aligned holes and are connected to an A.C. voltage source (0.5 to 50 kv at 60 Hz) for generating A.C. electrodynamic fields across the duct. The electrical forces generated by the A.C. fields trap the charged particles in the air flow and direct them through the holes to sides of the duct from which they can be removed. The particle trapping is enhanced by coating the plate members with a high dielectric strength material such as plastic or silicone; this allows operation at a higher A.C. voltage which may be sufficiently high to produce a corona discharge and obviate the need for separate conductors operated at high voltage D.C. The filter is especially well adapted for removing particles in the size range of 0.01 to 100 micron in diameter.

31783 APTIC NO. 53906

Williams, M.

M.O.S. SYSTEM REDUCES EXHAUST POLLUTION. *Electron. Power, 19(2):264-268, June 28, 1973. 4 refs.*

A digital memory system using metal-oxide-semiconductor (m.o.s.) integrated circuits to control the fuel input to the automobile engine is described. By running the engine with a high air/fuel ratio, the pollutants can be controlled at the source. To obtain optimum combustion, all the resonances that occur in the inlet manifold and exhaust systems, and the subsequent effect on engine breathing, must be completely matched by changes in fuel. Careful selection of the transducers which measure air flow is essential. The most suitable engine parameters that favor those requirements are throttle angle and engine speed. An engine temperature sensor provides an automatic choke facility, while correction for air density is obtained from a barometric pressure sensor and an air temperature sensor. The electronic control unit receives all these signals simultaneously and computes the optimum amount of fuel required by the engine while the fuel is being injected. The fuel metering is achieved by means of a rapid operating solenoid injector. Fuel pressure is maintained constantly at 207 kN/sq m by means of a pressure regulator. The period for which the injectors are open is proportional to the fuel quantity being delivered. The electronic controller therefore determine the engine fueling by controlling the time of injection. Hence the word stored in the memory corresponds to an interval of time. One feature of the system is the very rapid measurement of air flow, thus eliminating the need for transiently enriching the fuel supplied to the engine under acceleration conditions.

31784 APTIC NO. 53796

Yabe, Makoto and Yasuji Senkai

STUDY OF LARGE-SIZE TCA-METHOD OF UNIFORM GAS FLOW. *(Daitokei TCA no kenkyu--gasu henryu no boshi hoho). Text in Japanese. Ishikawajima Harima Giho (Ishikawajima-Harima Eng. Rev.), no. 5:31-36, May 1973.*

Experiments with a model were conducted in order to study the possibility of enlarging TCA (Turbulent Contact Absorber) scale. The purpose of the experiments was to determine the cause of uneven gas flow, to evaluate the gas flow control tests conducted in the past, and to apply and evaluate all possible methods of controlling the gas flow. Experiments using various ladder vanes revealed that the uneven flow was caused by the fluidized bed of packing material. In order to obtain a uniformal, even flow, placing a porous panel with appropriate resistance or ladder vanes with similar resistance under the bed was effective. The change of the direction of the gas flow resulted in an approximately even up-current.

31785 APTIC NO. 53786

Yamaguchi, Fumihiko

GAS ABSORBER (TCA PLANT). *(Gasu kyushu sochi (TCA puranto) no gaiyo). Text in Japanese. Ishikawajima Harima Giho (Ishikawajima-Harima Eng. Rev.), no. 5:61-65, May 1973.*

The principles and structure of TCA (Turbulent Contact Absorber) are described. Exhaust gas is blown into the tower and mixed with atomized absorbent liquid sprayed from the upper spray nozzles through the movement of packed spherical balls. The treated gas is discharged after eliminating the mist completely by a mist eliminator. The difference between a TCA and an ordinary packed tower is the method of the air-liquid contact in the grid. The characteristics of this method are: large gas treatment capacity and stable result regardless gas quantity; superior absorption efficiency; no clogging by dusts or reaction formation; even and uniformal gas flow. When the quantity of gas increases, the movement of packed balls increases and gas-liquid contact increases. TCA can be applied to the treatment of sulfur dioxide, hydrogen sulfide, hydrogen fluoride, silicon fluoride gas, chloride gas, hydrogen chloride, and other gases. For an absorbent, caustic soda, slake lime, carbide residue, lime, magnesium oxide, zinc oxide, ammonia, saline water (sea water), or various alkaline liquid wastes can be used. Chemical reactions of various absorbents are explained.

31786 APTIC NO. 53789

Yevzelman, I. B. and G. D. Kharlampovich

DECONTAMINATION OF THE GASEOUS EMISSIONS GENERATED BY PHTHALIC ANHYDRIDE PRODUCTION. *(Obezvrezhivaniye otkhodyashchikh gazov proizvodstva ftalevogo angidrida). Text in Russian. Khim. Prom. (Moscow), no. 6:426-428, 1973. 11 refs.*

A method for the removal of phthalic and maleic anhydrides, 1,4-naphthoquinone, and phthalic acid from the air of phthalic anhydride production plants, and a method for the recovery of the separated pollutants are described. The flue gases with an organic content of 1 to 1.5 g/cu m are scrubbed in a foaming apparatus, using 21-25 C washing liquid. As a result of the washing operation, concentrated solutions of maleic acid (231.5 g/l), phthalic acid (68.2 g/l), and 1,4-naphthoquinone (2.8 g/l) are obtained at a purification efficiency of 98.7-100%. The solid phase of the washing liquid which is hardly soluble in water and in maleic acid solutions (phthalic acid and naphthoquinone) is periodically or continuously removed by means of an automatic filter press. The filtered solution is treated with carbamide or ammonia at 100 C to obtain an aqueous solution of acid ammonium maleate, ammonium fumarate, and ammonium aspartate for further utilization.

31787 **APTIC NO. 53602**

Young, Harold K. and Herbert Wald

EXHAUST SYSTEM FOR FURNACE RETORT. *(Bethlehem Steel Corp.) U. S. Pat. 3,721,429. 4p., March 20, 1973. 9 refs. (Appl. Oct. 30, 1967. 4 claims).*

An exhaust system for scrubbing waste gas from a metal treating retort and regulating the pressure in the retort is described which includes an apparatus for withdrawing the gas from the retort and cooling the gas. The cooled gas is transferred to a liquid sealing vessel containing a gas diffusing structure, gas exhaust tube, liquid discharge tube leading to a secondary seal or drain, and a communicating liquid leveling vessel. The leveling vessel is equipped with an adjustable drain and an inlet for introducing fresh liquid. The invention provides for a constant pressure in the heat treating retort and simultaneous removal of impurities from the foul waste gas, the soluble impurities being discharged with the scrubbing medium. The gas, which is ultimately exhausted to the atmosphere, is relatively free of objectionable components. The sealing and scrubbing device requires very little maintenance. (Author abstract modified)

1972

31788 **APTIC NO. 53905**

Boresta, John G.

ADJUSTABLE VENTURI GAS SCRUBBER. *(Chemical Construction Corp., New York) U. S. Pat. 3,690,044. 11p., Sept. 12, 1972. 11 refs. (Appl. March 18, 1970, 14 claims).*

An adjustable venturi gas scrubber for the scrubbing of a gas stream to remove entrained solid particles and other contaminants such as mist, vapors, or noxious gaseous components like sulfur dioxide is described. The throat is adjusted to compensate for changes in gas flow rate by suspending the central conical baffle from a central ventical rod which extends upwards from the apex of the conical baffle and which is vertically movable. Two venturi gas scrubbers are also provided in series within a container and in vertical alignment, with the upper scrubber having an adjustable throat. The first scrubber removes entrained solid particles from the gas stream and the second scrubber removes gaseous contaminants such as SO2. The principal advantage of the adjustable annular venturi is that the apparatus may be modified to accommodate for varying gas flow rates or compositions by adjustment or vertical displacement of the central conical baffle, by means of structure which is nonclogging and free of liquids seals which can become inoperative or leaky due to entrance of grit or other solids particles derived from the gas stream. (Author abstract modified)

31789 **APTIC NO. 53599**

Dyla, John F., William M. Moore, and Robin A. Attfield

ELECTRO-PRECIPITATION. *(Lodge-Cottrell Ltd., Birmingham (England)) U. S. Pat. 3,688,475. 13p., Sept. 5, 1972. 13 refs. (Appl. March 16, 1970, 8 claims).*

An improved electro-precipitator electrode support structure has been developed in connection with improvements relating to electro-precipitators of the Cottrell type. The support structure consists of an upper portion containing numerous vertical elongated support members which extend upward from a central region of the structure, a lower portion also consisting of numerous vertical elongated support members which are nonintegral with the upper support members and which extend downward from the central region, and a braced cage which connects the upper and lower support members at the center. The device is designed to overcome problems such as swinging movements and bowing of the discharge electrodes which can significantly affect the electro-precipitation of, for example, dust from gases.

31790 **APTIC NO. 53782**

Faulkner, Bonnie G.

AFTERBURNING DEVICE FOR INTERNAL COMBUSTION ENGINES. *(Assignee not given.) U. S. Pat. 3,690,105. 6p., Sept. 12, 1972. 8 refs. (Appl. April 8, 1971, 8 claims).*

An apparatus which substantially reduces the uncombusted hydrocarbons in the exhaust gases from an internal combustion engine by causing further combustion in the manifold of the engine adjacent to the cylinder exhaust valves is described. The further combustion is derived by injecting additional oxygen into contact with the hot exhaust gases. The oxygen is injected by means of a supply tube inserted coaxially in the manifold collection chamber with venturi ports which draw in air from the outside. In alternate forms, air is drawn from the engine oil pan area through the oil breather cap, and from both the atmosphere and the oil pan area, simultaneously. Unlike other devices, this apparatus provides substantially complete combustion and avoids the outflow from the engine exhaust of uncombusted hydrocarbon irritants that tend to produce smog and other disadvantageous products. (Author abstract modified)

31791 **APTIC NO. 53824**

Flutterer Bodo, Otto Stemme, and Jurgen Mayer

ELECTROFILTER FOR GASES. *(Assignee not given.) U. S. Pat. 3,690,043. 4p., Sept. 12, 1972. 39 refs. (Appl. Nov. 24, 1969, 2 claims).*

A perforated electrode for an electrofilter for gases is described. It includes a sandwich like arrangement of at least one electrically conductive support layer and a thin spray discharge layer. The spray discharge layer is formed from a material which has a higher resistance to burning due to spray discharge than the material of the support layer. Unlike other filters, this filter has a sieve with a relatively high mechanical stability. The perforation edges have extremely small radii of curvature which do not become larger even on burning away of the perforation edges. (Author abstract modified)

31792 **APTIC NO. 53791**

Gorin, Everett and Paul M. Yavorsky

CYCLIC PROCESS FOR REMOVAL OF SO2 FROM FLUE GAS. *(Consolidation Coal Co., Pittsburgh, Pa.) U. S. Pat. 3,690,818. 8p., Sept. 12, 1972. 10 refs. (Appl. March 29, 1971, 5 claims).*

A cyclic process for continuously removing sulfur dioxide from flue gas which includes absorption of the SO2 by a liquid absorbent and regeneration of the spent liquid absorbent is described. The absorption is effected by passing the SO2 containing flue gas in contact with sodium, potassium, or ammonium formate in a liquid state at a temperature above 140 F, but below the decomposition temperature of the formate, and preferably below 475 F. The spent absorbent is sent to regeneration before all the formate has been consumed, that is, preferably before more than 25% by weight of the formate has been consumed. In the regeneration part of the cyclic process, the spent absorbent, still containing unused formate, is converted back to fresh formate by heating the spent absorbent above 475 F, preferably above 600 F, and passing a reducing gas containing carbon monoxide through the liquid absorbent, whereby the absorbent is made effective again for absorption of SO2. The high temperature eliminates the need to reheat the scrubbed flue gas to effectively remove ground level contaminants. (Author summary modified)

31793 **APTIC NO. 53792**

Gorin, Everett and Paul M. Yavorsky

DESULFURIZATION OF FLUE GAS. *(Consolidation Coal Co., Pittsburgh, Pa.) U. S. Pat. 3,690,824. 7p., Sept. 12, 1972. 10 refs. (Appl. Nov. 24, 1969, 5 claims).*

A new reaction for the removal of sulfur dioxide from flue gas is described in which the SO2 reacts with sodium, potassium, or ammonium formate to form the corresponding thiosulfate. The reaction is preferred in a liquid state, at a temperature above 140 F, but below the decomposition temperature of the formate, and preferably below 475 F. The high temperature in the process eliminates the need to reheat the scrubbed flue gas to effectively remove ground level contamination. The formate may be dissolved in any chemically inert solvent which is liquid within the above temperature range. Water is the preferred solvent when a solvent is used. However, the salt may be used in the molten state rather than in a solvent. Suitable mixtures of the formates may be used. A suitable wet absorbent is the eutectic mixture containing 96% sodium formate which melts at 320 F, 13 deg below the melting point of the pure potassium salt. The SO2 in the flue gas reacts very rapidly and completely with the formate to form principally the corresponding alkali metal thiosulfate at temperatures above 140 F and up to 475 F. The reaction is an oxidation reduction reaction rather than an acid base reaction as in other processes. (Author summary modified)

31794 **APTIC NO. 53821**

Guerrieri, Salvatore A.

PROCESS FOR TREATING FLUE GASES. *(Assignee not given.) U. S. Pat. 3,689,213. 3p., Sept. 5, 1972. 8 refs. (Appl. Feb. 19, 1970, 2 claims).*

A process for treating flue gases to remove fly ash more effectively by an electrostatic precipitator is described. Liquid sulfur dioxide is vaporized and admixed with an excess of compressed and dehumidified oxygen-containing gas. The mixture is introduced into a converter wherein the SO2 is converted to sulfur trioxide. The gaseous products from the converter are introduced into a flue gas, produced by the combustion of a low sulfur, solid fossil fuel, prior to its passage through an electrostatic precipitator. This system contains no liquid SO3 and so little SO3 that the hazards associated with SO3 are essentially eliminated. (Author abstract modified)

31795 **APTIC NO. 53598**

Lenane, Denis L.

EXHAUST SYSTEM. *(Ethyl Corp., New York) U. S. Pat. 3,688,476. 8p., Sept. 5, 1972. 10 refs. (Appl. Nov. 24, 1969, 19 claims).*

A cyclone type inertial particulate separator with greatly improved collection efficiency has been developed using a cyclone separator which is provided with particulate reject holes in the side wall of the cyclone chamber rather than in the bottom plate. Effectiveness can be increased further by filling the collection chamber with a porous material such as wire mesh where the particulate gathers in the interstitial spaces. Operationally, a gas containing particulates enters the cyclone chamber at the entry port and is induced into cyclonic rotation by conventional means, spiraling down the chamber and throwing particulate material against the wide wall. The particulates are rejected into the collection chamber upon reaching the reject slots. The spiraling gas vortex reaches a solid end closure and reverses direction spiraling up an passing into an exit tube which conducts the cleaned exhaust gas through an end closure. The exit tube can be adapted to engage another conduit to carry the clean gas to a more remote location or to another unit for further treatment, such as to a conventional catalytic muffler. The size relationship of the cyclone separator depends upon the gas volume and particulate size and can readily be determined by well known methods. Good results for removing particulates from the exhaust gas of an automotive engine can be obtained by using a cyclone chamber about 2-3 in. in diameter and 6-12 in. long with an exit tube of 1-2 in. in diameter.

31796 **APTIC NO. 53783**

Lincoln, Roland L.

SPRAY NOZZLE FOR GAS SCRUBBERS. *(Assignee not given.) U. S. Pat. 3,692,244. 4p., Sept. 19, 1972. (Appl. April 22, 1970, 2 claims).*

A liquid spray nozzle which is particularly adapted for use with a gas scrubber is described. Unlike other nozzles, this nozzle can atomize unfiltered liquid at flow rates up to 200 gal/min and more without becoming plugged and can operate at either high or low pressure air. The interior of the nozzle consists of two tubes. The first tube is cone shaped and includes a longitudinal portion with a substantially constant cross sectional area from which an inlet conduit which connects to the source of liquid extends. A spray director is mounted to the first tube by an annular plate and threaded rods. The second tube is mounted concentrically with the first tube. A plate with a plurality of orifices opens and closes the second tube depending upon the pressure. The liquid enters the first tube and goes into the mixing chamber. Gas at elevated pressure enters through the second tube and goes into the mixing chamber. The mixture is forced out the spray director into the scrubber. (Author summary modified)

31797 **APTIC NO. 53818**

Low, David N.

SCRUBBING OF GASES CONTAINING TICL4. *(E. I. du Pont de Nemours and Co., Wilmington, Del.) U. S. Pat. 3,690,041. 7p., Sept. 12, 1972. 6 refs. (Appl. Sept. 30, 1971, 3 claims).*

A method of scrubbing gas streams containing titanium tetrachloride is described. When an anhydrous gas stream composed predominantly of inert gases and containing appreciable quantities of hydrogen chloride and TiCl4 is contacted with an aqueous based liquid in an amount in excess of that required to saturate the stream with water, the HCl is absorbed in the form of an HCl solution. The improvement is that at least 0.2 sec prior to the contact, an initial quantity of water is evaporated in the stream. The quantity is less than that required to saturate the stream at the existing temperature and pressure conditions, but greater than that stoichiometrically required to react with the TiCl4 in the stream to form titanium dioxide. (Author abstract modified)

31798 **APTIC NO. 53719**

McLean, Kenneth J.

SURVEY OF AUSTRALIAN EXPERIENCE IN COLLECTING HIGH RESISTIVITY FLY ASH WITH ELECTROSTATIC PRECIPITATORS. (FINAL REPORT). *South Wales Univ., Wollongong (Australia), Wollongong Univ. College, Environmental Protection Agency Contract 68-02-0245, EPA-R2-73- 258, 78p., Sept. 1972. 29 refs.*

NTIS: PB 221139

A survey has been made of the Australian experience in using electrostatic precipitators to collect fly ash resulting from the combustion of low sulfur bituminous coal in pulverized boilers. This ash has a very high resistivity and is exceptionally difficult to collect, requiring in some cases precipitators with specific collecting areas above 600 sq ft/kcfm, providing no gas conditioning is used. The flue gas temperature in the collectors is in the order of 260 F in order to assist in the collection, and it is proposed in the future to operate one unit at 220 F. The effective migration velocities are very low with values varying from below 3 cm/sec to a maximum of 8 cm/sec. Electrostatic precipitators often operate with some back corona current flowing. The useful corona current density may be in the order of 8 microamps/sq ft, and the back corona current may be two to three times this value. Optimum operating conditions are often at a voltage level just below sparking. Good rapping is necessary if high performance is to be obtained. Transverse accelerations of 60 g are necessary in order to adequately remove the deposited layer from the collecting plate. The performance of all the Australian ashes can be improved by flue gas conditioning; sulfur trioxide probably gives a better performance level, although good results have been obtained with ammonia. Technical scale and laboratory tests have been performed to determine the characteristics of fly ash since the sulfur content of the coal cannot be used to reliably predict the electrostatic precipitating properties of the fly ash. Various test procedures are described and evaluated.

31799 **APTIC NO. 53823**

Neumann, Gerhard Max

AIR FILTER. *(Assignee not given.) U. S. Pat. 3,690,045. 11p., Sept. 12, 1972. 9 refs. (Appl. Feb. 5, 1969, 7 claims).*

A filter device for the separation of suspended, and in particular, radioactive substances from a flow of air or gas is described. The filter consists of a contaminated gas duct, a filter gas duct (each duct has a stub), a disposable filtering assembly having an inlet stub and an outlet stub intended to be attached to the contaminated gas stub, and the filtered stub. Two tubes of flexible sheet material are attached to the inlet and outlet stubs. Each duct stub has two gas tight securing means. The first securing means allows attachment of the corresponding tube, while the second securing means allows addition of successive replacement filtering assemblies, after sealing and cutting of the tube, so that the remnant of tube attached to the duct stub may be detached from the first securing means after being surrounded by a new tube attached to the second securing means. The new tube is subsequently secured by the first securing means and released from the second securing means. Unlike other devices, it is no longer necessary to extract the filter elements from the filter housing, since the filter assembly receiving the filter elements may have its connecting flanges disconnected externally from the flanges of the duct. (Author abstract modified)

31800 **APTIC NO. 53691**

Niedzwiecki, Richard W. and Robert E. Jones

POLLUTION MEASUREMENTS OF A SWIRL-CAN COMBUSTOR. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA-TM-X-68160, 15p., 1972. 6 refs. (Presented at the American Institute of Aeronautics and Astronautics and Society of Automotive Propulsion Joint Specialists Conference, 8th, New Orleans, La., Nov. 29-Dec. 1, 1972.)*

NTIS: N73-11974

Pollutant levels of oxides of nitrogen, unburned hydrocarbons, and carbon monoxide were measured for an experimental, annular, swirl-can combustor used for jet aircraft. The combustor was 42 in. in diameter, incorporated 120 modules, and was specifically designed for elevated exit temperature performance. Test conditions included combustor inlet temperatures of 600, 900, and 1050 F, inlet pressures of 5 to 6 atm, reference velocities of 69 to 120 ft/sec, and fuel-air ratios of 0.014 to 0.0695. Tests were also conducted at a simulated engine idle condition. The results demonstrated that swirl-can combustors produce NOx levels which are substantially lower than those produced by conventional combustor designs. These reductions are attributed to reduced dwell times resulting from short combustor length, quick mixing of combustion gases with diluent air, and uniform fuel distributions resulting from the swirl-can approach. The radial staging of fuel at idle conditions resulted in substantial increases in combustion efficiencies and corresponding reductions in pollutant levels. (Author abstract)

31801 **APTIC NO. 53946**

Patterson, D. J., R. H. Kadlec, B. Carnahan, H. A. Lord, J. J. Martin, W. Mirsky, and E. Sondreal

KINETICS OF OXIDATION AND QUENCHING OF COMBUSTIBLES IN EXHAUST SYTEMS OF GASOLINE ENGINES. ANNUAL PROGRESS REPORT NO. 3. (FINAL REPORT). *Michigan Univ., Ann Arbor, Dept. of Mechanical Engineering and Michigan Univ., Ann Arbor, Dept. of Chemical Engineering, Coordinating Research Council Contract CAPE-8-68(1-68)-CRC, Environmental Protection Agency Contract CPA-22-69-51-HEW, 299p., 1972. 54 refs.*

NTIS: 310830-3-F

A comprehensive analytical and experimental study of thermal reactors was made. The findings were incorporated into a computer model capable of simulating reactor performance both during warm-up and steady-state operation. Arbitrary reactor configurations were explored in regard to the steady-state and warm-up extent of oxidation of hydrocarbons, carbon monoxide, and hydrogen with perfect or imperfect mixing and the detrimental effects of heat losses. Reactor size, shape, and material as well as start-up temperature were also explored for their effect on reactor lightoff time with various levels of exhaust of hydrocarbons, carbon monoxide, and hydrogen. The experimental and analytical program focused on the Chevrolet 350 cu in. engine duPont Model V reactor combination. Experimental and calculated results are presented and compared where possible. Analytical models for the duPont reactor were developed each of which treated the exhaust ports, core, and annulus differently. An experimental technique was developed which permits an assessment of the completeness of mixing between exhaust and injected air within a thermal reactor and is expected to be useful as a design aid. Measurements were also made to determine any changes in nitric oxide, aldehydes, olefins, paraffin, and aromatic class proportion affected by the thermal reactor at selected operating conditions. Separate studies were also conducted in a stirred tank reactor to determine global oxidation kinetics for exhausts of carbon monoxide, hydrocarbons, and hydrogen to be used in the computer simulation.

31802 **APTIC NO. 53820**

Salemink, Willard L.

PORTABLE APPARATUS FOR REMOVING PARTICULATE MATERIAL FROM EXHAUST GASES. *(Assignee not given.) U. S. Pat. 3,690,039. 6p., Sept. 12, 1972. 3 refs. (Appl. Aug. 17, 1970, 3 claims).*

A portable apparatus for removing particulate material from exhaust gases is described. It consists of a washing chamber connected to a settling pond to form an integral portable unit. The apparatus includes an elongated settling pond with a U-shaped gas washing chamber connected to it. The chamber is adapted to receive the particle laden gases and subject the gases to water spray. This spearates the material from the gases into a particle water slurry which is pumped into the pond where the particles settle out and are removed by a scraper unit, while the purified gases escape to the atmosphere. This apparatus is particularly suitable for asphalt plant discharges and eliminates tractors, cranes, and personnel required by other assemblies to transport or assemble the washer at the plant site. (Author abstract modified)

31803 **APTIC NO. 53745**

Smith, Richard D. and Dale A. Furlong

AIR POLLUTION-FREE INTERNAL COMBUSTION ENGINE AND METHOD FOR OPERATING SAME. *(Com-*

bustion Power Co., Inc., Palo Alto, Calif.) U. S. Pat. 3,696,795. 14p., Oct. 10, 1972. 17 refs. (Appl. Jan. 11, 1971, 7 claims).

An air pollution-free internal combustion engine and a method for operating it are presented. The engine has at least one cylinder, an exhaust port and valve, fuel, oxygen gas and water spray injectors, a piston in the cylinder, means for cyclically opening and closing the exhaust valve, a fuel storage and supply system for feeding hydrogen gas or a liquid hydrocarbon to the fuel injector, an oxygen storage and supply system for feeding substantially pure oxygen to the oxygen gas injector, means for igniting the injected mixture of fuel and oxygen, and a water recovery system for recovering water from the exhaust discharged from the cylinder and for recycling the recovered water to the water spray injector. In a typical engine cycle, the exhaust valve is closed prior to completion of the exhaust stroke to entrain some exhaust gas in the cylinder as a working fluid. Oxygen is then injected into the cylinder after the exhaust valve is closed and before the piston reaches top dead center on the exhaust stroke, and while relatively low pressures exist in the cylinder. Fuel is next progressively injected under pressure into the oxygen contained in the cylinder so that fuel burns progressively as it is injected to preclude knocking problems. After combustion is substantially completed, the exhaust valve opens just before the piston reaches bottom dead center on the power stroke when water is injected into the cylinder to cool the cylinder walls, piston, dome, combustion chamber wall and exhaust gas. A portion of the exhaust gas is then discharged from the cylinder through the exhaust port on the exhaust stroke. The engine operates at near stoichiometric temperatures because the amounts of nitrogen which are injected when air is the oxidant are not present and thus there is no nitrogen to heat, only the products of combusltion (carbon dioxide and water) plus any excess oxygen. Fuel vaporization proceeds rapidly because of the high flame temperature and a high rate of heat transfer to the fuel droplets occurs. (Author abstract modified)

31804 **APTIC NO. 53793**

Volker, Herbert

APPARATUS FOR INCINERATING WASTE GASES. *(Assignee not given.) U. S. Pat. 3,690,840. 5p., Sept. 12, 1972. 4 refs. (Appl. Aug. 24, 1970, 8 claims).*

A cylindrical form thermal catalytic incinerator (afterburner) unit for treating waste gas streams is described. The catalytic bed traverses the downstream end of the combustion chamber to effect contact with the mixture of waste gases and burner products from a burner axially positioned at the opposing inlet end of the combustion chamber. An annular heat exchange section around the combustion zone provides for cooling the resulting oxidized gas stream and for preheating the incoming noxious stream which is then fed circumferentially around the burner to admix with the flame and hot gases. Unlike others, the components in this incinerator are arranged compactly and in a manner minimizing stresses and damages of the inner lining and parts of the casing due to appropriate arrangement of the cooling means. (Author abstract modified)

1970

31805 **APTIC NO. 53700**

Muhlrad, W. and J. Remillieux

FORMATION OF ACID MISTS. USUAL METHODS OF REMOVAL. A NEW SOAKED FABRIC PROCESS. *(Formation de brouillards acides. Procedes usuels de captation. Procede nouveau par tissu arrose). Text in French. Chim. Ind., Genie Chim., 103(21):2755-2763, Dec. 1970. 2 refs.*

Particles of mechanical origin have relatively coarse dimensions and are easily removed while those of chemical and thermal origin have submicronic dimensions and cannot be removed efficiently by classical separation methods. An indication of the nature of the mist can be gained with the help of a microcyclone which assures 100% captation of particles larger than 5 micron and of specific weight of 1 kg/cu cm; the relative amount of liquid captured by the microcyclone thus indicates the percentage of particles larger than 5 micron. Until relatively recently electrostatic precipitators were the only meabs of controlling fine mists, but they are expensive and the soaked fabric process has emerged as, in some cases, a better alternative. While even very tightly woven fabrics with 10 to 20 micron pores will not retain liquid particles of thermal origin, moistening the fabric with a spray pulverized into the gas will form a filtering layer which will retain the fine mist of submicronic dimensions. Fabrics of synthetic fibers resistant to acid corrosion like polyvinyl chloride or polypropylene are utilizable for the breaking up of acid mists. The operation takes place in an enclosed tank containing a horizontal layer of the fabric humidified from above by jets. The volume that can be processed increases with flow velocity. The amount of water sprayed on the filter can vary from 0.5 to 6 l cu m gas treated. Polyvinyl sleeves will, with gas velocity of 0.92 cm/sec and spraying volume of 0.65 l/cu m gas, reduce hydrogen chloride concentration in a gas from 2.3 g/cu m to 18.25 mg/cu m with an efficiency of 99.2%.

31806 **APTIC NO. 53957**

Murray, Richard George

A HYDROGEN ENGINE AND CONTROL CIRCUIT DESIGN. *Oklahoma State Univ., Dept. of Mechanical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1970, 101p. 16 refs.*

An electrical circuit to synchronize the operation of a mechanical injection system for hydrogen fuel was developed. The purpose was to further the development of a practical H2 burning engine which will reduce contamination in the air consisting of carbon monoxide, carbon dioxide, sulfur dioxide, and other combustion products commonly produced by internal combustion engines. This device will also reduce the depletion of the earth s oxygen and fossil fuel supplies. A preliminary design study, fabrication and design of a prototype mechanical injector research engine, the fabrication and design of an engine test facility, the engine s characteristics when fueled with iso-octane, and testing, modification, and retesting of this engine when fueled with H2 are discussed. The design, fabrication, and testing of a prototype control circuit for use on a H2 engine are also mentioned. A mechanical injector engine which modified a conventional single cylinder industrial engine to incorporate a camshaft operated injector for H2 fuel delivery would overcome the two major problems which are engine knock, caused by detonation and preignition, and excessive engine operating temperatures, which occcur when pure oxygen is used as the oxidizer.

1949

31807 **APTIC NO. 53706**

McCord, Carey P. and William N. Witheridge

AIR CONDITIONING AND ODORS. *In: Odors - Physiology and Control. New York, McGraw-Hill, 1949, Chapt. 15, p. 157-165.*

Ventilation is now understood to be necessary for the control of body odors, tobacco smoke, cooking odors, and other odorous impurities for which the human occupants of residential and commercial spaces are responsible, and not to preserve the oxygen-carbon dioxide balance of the indoor atmosphere as was previously believed. The intensity of body odor perceived upon entering an occupied room from relatively clean air varies inversely with the logarithm of the quantity of outdoor air supplied and the logarithm of the air space allowed per person. For tobacco smoke, however, small volumes of air space with high ventilation rates per capita are preferable to larger volumes of air space. Neither high temperatures nor high humidities significantly accentuate odors in the air, while accumulations of dust, moisture, and organic matter inside the ducts and mechanical equipment of air conditioning systems may become a troublesome source of odors. Thus, the spray water used in air conditioning systems must be constantly renewed to avoid the return of odorous materials to the airstream. With regard to disinfectants and deodorants, it is more effective to add them directly to the air as it passes through the ducts or plenum chambers than to it is to add them to the recirculating spray water. There are some cases where effective dust and smoke removal must be provided together with the adsorption of gaseous contaminants for completely satisfactory odor control; a combination of electrostatic precipitation and activated carbon adsorption is highly effective in providing such control. Both the air supplies and air exhausts of ventilated buildings in heterogeneous districts must be cleaned via removal, masking, cancellation, or destruction of the offensive odors.

31808 **APTIC NO. 53707**

McCord, Carey P. and William N. Witheridge

CHEMICAL AND PHYSICAL DESTRUCTION OF ODORS. *In: Odors - Physiology and Control. New York, McGraw-Hill, 1949, Chapt. 16, p. 166-184. 14 refs.*

Methods of chemical and physical destruction of odors are reviewed, and the future for photolysis as an odor combatant is discussed. One of the oldest and best methods of odor destruction is combustion, providing it is complete. Incomplete combustion in diesel and internal combustion engines, for example, yields the irritating aldehydes, with formaldehyde as the principal ingredient in the malodorous group. The minimum combustion temperature for the complete destruction of garbage, meat refuse, corn products waste, and the like, may range from 1400 to 2000 F. The list of chemical agents that are known to have some antiseptic-deodorizing property includes groups such as coal tar derivatives, oxidizing agents such as the hypochlorites, acids, halogens, gaseous agents, salts of metals, and certain non-toxic dye products such as gentian violet or neutral aciflavine. Ozonation is effective not only for odor destruction, but also for decolorizing and sterilizing. There also seems to be a reasonable future chance that knowledge of the photolytic wavelengths for a given offensive odor molecule will make it possible to irradiate the gas with a frequency giving the highest quantum yield in the confines of a discharge stack or ventilating system as a means of effecting its destruction. Activation or dissociation wavelengths could be studied to determine where on the spectrum it would be most efficacious to expend energy of decomposition when the analysis of stack gas shows a number of offensive constituents.

31809 **APTIC NO. 53708**

McCord, Carey P. and William N. Witheridge

ODOR MASKING. *In: Odors - Physiology and Control. New York, McGraw-Hill, 1949, Chapt. 17, p. 185-197. 10 refs.*

The principles and characteristics of the odor masking process are discussed with reference to the masking of textile odors; combustible aromatics and incense; soap odors and masking; the masking of paint, varnish, and lacquer odors; aromatic sprays and vapors; and the use of ozone as a masking agent. The process of masking is the obliteration of one odor by superimposing another to create a more compelling sensation, preferably pleasant. This masking effect is produced at the point of sense perception in the respiratory passages together with the final interpretation in the brain and does not constitute an aromatic correction of the aerial components. The use of ozone as an odor masking and odor destruction agent is limited by permissible quantities in living quarters which range from 0.01 to 0.05 ppm. Higher concentrations can be irritating to the mucous membranes of the upper respiratory tract.

31810 **APTIC NO. 53709**

McCord, Carey P. and William N. Witheridge

ODOR CANCELLATION AND COUNTERACTION. *In: Odors - Physiology and Control. New York, McGraw-Hill, 1949, Chapt. 18, p. 198-204. 9 refs.*

The concepts of odor masking, counteracting, canceling, compensating and neutralizing are discussed and defined with emphasis on the differences in meaning. Odor cancellation is conceived as a process that permits the odorous molecules to retain their individual identity, at least until they are removed from the area of olfactory reception. There is no chemical interaction to rearrange the elements and radicals into inodorous or less odorous substances (neutralization). If neither canceling nor decomposing processes are sufficiently complete to eliminate both of the odorous components, the deodorizing effect is classified as odor masking. When two or more substances are present in the atmosphere at concentrations that would be definitely perceptible if experienced alone but that counteract one another when together to an extent that neither is perceptible, the olfactory effects of these substances are said to be antagonistic. Likewise, the potentially compensating aromas may be present in the atmosphere in any proportion from the masking of A with B, through cancellation, to the point of masking B with A. Many of the masking processes in the atmospheric environment might be potentially capable of true cancellation by the careful adjustment and control of the aromatic components of the air.

31811 **APTIC NO. 53710**

McCord, Carey P. and William N. Witheridge

THE SORPTION OF ODORS. *In: Odors - Physiology and Control. New York, McGraw-Hill, 1949, Chapt. 19, p. 205-233. 24 refs.*

The absorption or solution of odorous gases and vapors in liquids or solvents by the use of washers, condensers, or scrubbers and the adsorption of odorous matter by activated carbon are reviewed. The most extensively used absorbers in the chemical industries are towers or vertical cylinders packed with materials like broken stone, hard coke, clay spheres, Berl saddles, or hollow cylinders or rings made of ceramic, metal, carbon, or glass according to the chemical and structural properties needed. The height of an absorption tower influences its efficiency, while the cross-section area determines the air-handling capacity. Superficial gas velocities (the velocity that would occur if no packing were present) generally range from 1 to 10 ft/sec. Water or scrubbing liquid flow rates are from 100 to 10,000 lbs/hr for each square foot of tower area. It is possible to modify the solvent in accordance with knowledge of the solute in all types of air washers. Thus, a hypochlorite solution may be indicated for meat-rendering odors, milk-of-lime for a sulfur dioxide scrubber, or sodium hydroxide for a nitrogen dioxide absorption system. Activated carbon has been used to a limited extent for the control of industrial odor nuisance by the process of adsorption. One advantage of such a system is that large volumes of air may be deodorized by temporarily storing the odors on carbon, and upon regenerating the carbon at a later time, the concentrated vapors desorbed from the carbon can be led to a furnace for destruction without seriously interfering with combustion efficiency.

MEASUREMENT METHODS

1973

31812 **APTIC NO. 53790**

ANALYSIS OF LOW-CONCENTRATION HCL IN THE AIR WITH QUADRAPOLE MASS SPECTROMETER. *(Kadoraporu keishitsuryo bunsekikei ni yoru taikichu enka* *suiso gasu no bunseki). Text in Japanese. Shimazu Hyoron (Shimazu Rev.), 30(1):87-89, March 1973.*

Hydrogen chloride content in the air in a chlorine acid bath plant and the air in the adjacent building were analyzed using quadrapole mass spectrometer. The water content in the sampling air was first trapped by dry ice (-78.5 C) and then hydrogen chloride in the sampling was solidified in the next container by liquid nitrogen (-196 C), and nitrogen oxygen gases were eliminated at this temperature by a vacuum pump. When gases were taken out, liquid nitrogen was eliminated and the temperature was returned to normal room temperature; hydrogen chloride was vaporized and quadrapole mass spectrometer was applied. The final HCl measurements in the two samplings were 210 ppm (air in the plant) and 41 ppm (air in the adjacent building).

31813 **APTIC NO. 53932**

Coordinating Research Council, Inc., New York, Smokemeter Evaluation Sub-Panel

EVALUATION OF RESEARCH TECHNIQUES FOR EVALUATING FULL-FLOW LIGHT EXTINCTION TYPE SMOKEMETERS. *CRC Proj. CAPI-1-64. 44p., Jan. 1973.*

NTIS: PB 219028

A research technique for assessing the performance of full-flow, light-extinction type smokemeters is described in detail. The technique consists of: bench tests to assess the basic optical and electrical characteristics of an instrument, including linearity (using neutral density filters) and response time tests; bench tests to evaluate the effect of operating environment on the instrument, including the effects of supply voltage, ambient light, ambient temperature, shock, and vibration on instrument output; and engine tests to evaluate performance in the actual use environment and comparative evaluations with the (known) performance of another instrument. Experience in the use of the technique indicates that it provides a useful guide to quantify the various performance characteristics of a smokemeter. Many laboratories have found it sufficient to use only selected portions of the technique to evaluate any given smokemeter, but all of the tests have been found useful at one time or another. (Author abstract modified)

31814 **APTIC NO. 53669**

Baba, Yoshio and Akimasa Kita

STUDY ON SELECTIVE REACTIVITIES OF METAL SALTS AGAINST MERCAPTANS AND SULFIDES. *(Merucaputan sarufaidorui ni taisuru kinzokuen no sentakuteki hanosei no kenkyu). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 8(3):17-23, May 1973. 5 refs.*

Selective reactivities of metal salts, such as cadmium sulfate, mercuric cyanide, mercuric chloride, and silver nitrate, against mercaptans and sulfides were determined. A recovery method of sulfur compounds from their reaction product with the metal salts was studied also to determine the efficiency of the technique. Cadmium sulfate and mercuric chloride were unsuitable for this purpose. Mercuric cyanide and silver nitrate were useful reagents for collecting mercaptans only and for simultaneous collection of both mercaptans and sulfides. Silver nitrate reacted almost completely with both mercaptans and sulfides, and decomposition of these reaction products with 6-N hydrochloric acid regenerated the original sulfur compounds with over 98% recovery efficiency. This concentrating technique is often used to prepare the analytical sample for gas chromatography.

31815 **APTIC NO. 53800**

Bird, Alvin N., Jr. and Joseph D. McCain

PARTICULATE SIZING TECHNIQUES FOR CONTROL DEVICE EVALUATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1973. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-282.)*

Measurement of the concentration and distribution of particles smaller than about 5 micron is necessary for assessing the potential contributions of particulate emission sources to long term atmospheric turbidity problems and human respiratory effects. To design and apply control equipment effectively, information on mass loading as a function of particle size is needed for the small particles (e.g., 0.2 to 5 micron in diameter). Field and laboratory tests were conducted to evaluate inertial sizing techniques, cascade impactors, and cyclones for field measurements of control device efficiency as a function of particle size. Over 300 particle size distribution measurements were made with 11 inertial classifiers on 12 stationary emission sources. No single inertial sizing device was suitable for all the sampling circumstances encountered on a wise variety of stationary emission sources. Further, reliable measurements of mass loading as a function of particle size for sizes below about 5 micron required a sample weighing accuracy of at least 30 micrograms, and 10-microgram accuracy was desirable. To achieve this accuracy in the field, it was necessary to use low-tar-weight (10 to 500 mg) impaction substrates (e.g., metal foil or glass fiber filter material.) (Author abstract modified)

31816 **APTIC NO. 53805**

Bromberg, Steven M., Gerald G. Akland, and John C. Puzak

SURVEY OF LABORATORY PERFORMANCE ANALYSIS OF SIMULATED AMBIENT SO2 BUBBLER SAMPLES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1973. 4 refs. (Presented at Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-154.)*

Sample vials of sodium sulfite in mannitol were distributed to 134 laboratories throughout the United States which routinely analyzed for atmospheric sulfur dioxide. No restrictions were placed on the method of analysis other than that the absorbing solution used be a tetrachloromercurate II solution. Each sample set contained five separate vials which, when mixed properly with absorbing reagent, simulated a 24-hour bubbler sample. The range of concentrations extended from the lower detectable limit of the pararosaniline method to the alert level as described in Federal regulations. Out of approximately 500 separate results, only 231 answers were within the chosen confidence limits of plus or minus two standard deviations. Thus, the probability of a random laboratory producing an acceptable result was less than 50%. The ability of a laboratory to produce an acceptable result is concentration dependent in that, as the SO2 concentration increases, the percentage of laboratories reporting acceptable results decreases. Only 30% of the participants were able to analyze four or five samples out of five acceptably. Recommendations to remedy the apparent problems include the use of standard reference samples and the improvement of intralaboratory quality control programs. Periodic interlaboratory studies to monitor the progress being made are planned by the Quality Control Branch of the Quality Assurance and Environmental Monitoring Laboratory. (Author abstract modified)

31817 **APTIC NO. 53636**

Chand, Ramesh

IMPROVED PERMEATION DEVICES FOR CALIBRATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 8p., 1973. 2 refs. (Presented at Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-155.)*

Permeation devices called ECOCAL devices have been developed for the dynamic generation of known concentrations of various gases and vapors such as sulfur dioxide, nitrogen dioxide, hydrogen sulfide, water vapor, and many hydrocarbons. The liquid phase ECOCAL devices exhibit temperature sensitivity of about 4%/C compared to 10 to 15%/deg

C for the O Keeffe type tubes. The gas phase ECOCAL devices exhibit temperature sensitivity of less than 0.5%/C. These devices offer a wider dynamic range of concentrations generated and are thus capable of providing both ambient and stack concentrations. (Author summary)

31818 **APTIC NO. 53654**

Chuan, Raymond L.

APPARATUS FOR SENSING AIRBORNE PARTICULATE MATTER. *(Susquehanna Corp.) U. S. Pat. 3,715,911. 6p., Feb. 13, 1973. 8 refs. (Appl. May 11, 1970, 12 claims).*

A simple, lightweight, and compact sensing apparatus for airborne particulate matter has been designed to measure directly and in real time the mass of airborne particulate matter. The impaction action of a decelerated small air jet is combined with a quartz crystal microbalance to detect, by mass sensing, the presence of micron-size airborne particulate matter. The quartz crystal is coated with a tacky or adhesive material (0.0001 g in mass, 3 mm in diameter, and 1 micron in thickness) and oscillates in a shear mode as part of a resonant circuit. The tacky layer on the crystal retains impacted particles, and such particles cause a decrease in the resonant frequency of the crystal. This frequency is mixed with that of a reference oscillator; and the differential frequency, which is proportional to collected mass, is indicated or recorded. (Author summary modified)

31819 **APTIC NO. 53697**

Cooper, J. A.

COMPARISON OF PARTICLE AND PHOTON-EXCITED X-RAY FLUORESCENCE APPLIED TO TRACE ELEMENT MEASUREMENTS OF ENVIRONMENTAL SAMPLES. *In: Pacific Northwest Laboratory. Annual Report for 1972 to the USAEC Division of Biomedical and Environmental Research. Vol. II. Physical Sciences. Part 2. Radiological Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., p. 57- 61, April 1973.*

NTIS: BNWL-1751 PT2

The sensitivities of particle and photon-excited energy-dispersive x-ray fluorescence were compared for the analysis of environmental samples including orchard leaf, bovine liver, aerosols, sea salts, and geological material. A total of about 22 elements were detected in the samples. High-energy (80 and 40 MeV) alpha- particle excitation techniques had sensitivity limits in the tens of ppm range while low energy (4 and 2 MeV) protons and photons had sensitivities from 1-5 ppm for elements between vanadium and molybdenum. The photon excitation technique permitted the measurement of elements at the 1 ppm levels in dry environmental material; its future sensitivities should approach a few tenths ppm. It has the potential to measure up to 25 elements in environmental samples and can provide upper limits in the 1-10 ppm range for 15-20 other elements.

31820 **APTIC NO. 53755**

Dravnieks, Andrew and William H. Prokop

SOURCE EMISSION ODOR MEASUREMENT BY A DYNAMIC FORCED-CHOICE TRIANGLE OLFACTOMETER. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 29p., 1973. 23 refs. (Presented at Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-276.)*

An olfactometer based upon forced-choice triangle statistical design was designed and constructed. One diluted odor sample and two nonodorous air blanks are presented dynamically at each dilution level. Each panelist is required to judge which of three ports is odorous and to signal a choice. The three ports are arranged in a circular symmetrical pattern to achieve a double-blind sample presentation since neither panelists nor panel leader know the correct choice until after the judgement is made. Dynamically diluted stimuli are presented at constant flow in ascending concentration order, increasing by a factor of three per step. Three odor dilution steps are available on a continuous basis during the evaluation. The evaluation of one sample is routinely completed by a panel of nine within less than 15 minutes. Statistical data compilation is achieved by ranking procedures to obtain the average panel odor threshold for each sample. The testing of rendering plant odor emissions resulted in a satisfactory correlation between the dynamic olfactometer and syringe dilution methods. (Author abstract modified)

31821 **APTIC NO. 53630**

Friedrich, Henry E. and David M. Benforado

UTILIZATION OF THE ODOR PANEL TECHNIQUE FOR EVALUATING ODOROUS INDUSTRIAL EMISSIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 36p., 1973. 9 refs. (Presented at Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-271.)*

The syringe dilution technique offers an unsophisticated, practical method for odor evaluation whereby large numbers of stack emission gas samples can be easily obtained in the field by plant personnel and the samples readily analyzed by a trained panel under the required sensory testing laboratory controlled conditions. It is important that the panel used for the odor evaluation be screened for perceptiveness and have adequate training and experience. The persons used on the panel should have demonstrated their ability to read odors in a consistent manner, and odor panel results should be monitored to determine the reliability of the panel members responses. While there may be some concern as to the absolute values obtained with the static syringe technique compared to the dynamic dilution technique, this does not preclude the use of this simple method for odor evaluation work when using a trained panel. Further, the practical guidelines arrived at for acceptable odor concentrations in industrial exhaust gases (based on a number of years experience by organizations such as the Los Angeles County Air Pollution Control District and Minnesota Pollution Control Agency) are still valid. Because of the complexities involved, similar experience should be demonstrated prior to the acceptance of any proposed techniques. By proper panel selection and training, the syringe dilution technique can be used to assess industrial odor emission sources, to evaluate control equipment effectiveness, and to judge compliance with odor nuisance regulations when applicable. (Author summary)

31822 **APTIC NO. 53843**

Fujiwara, Sachio and Toshie Yoshimura

PRESSURE DROP OF A NUCLEPORE MEMBRANE FILTER. *(Nyukuripoa menburen firuta no atsuryoku sonshitsu ni tsuite). Text in Japanese. Preprint, Japan Society of Chemical Engineering, Kansai Branch, p. 34-36, 1973. 3 refs. (Presented at the Japan Society of Chemical Engineering, Study Meeting, Himeji, Japan, Aug. 27-28, 1973.)*

A nuclepore membrane filter was studied for filtering fine particles. The surface structure was studied by a microscopic method with respect to the pore diameter and two dimensional space ratio. The calculated pressure drop was compared with the experimental value. An electron and regular microscope were used to determine pore structure. The surface of the filter was coated with chromium and carbon particles; then the coated filter was dipped into a potassium hydroxide solution; and the vacuum metallized film was separated by a 50% acetone solution. The separated film was photographed through a microscope at 2000 magnification. The calculated and experimental values agreed; the fine pore diameters were uniform in the shape of a circle.

31823 **APTIC NO. 53660**

Goodson, Louis H., William B. Jacobs, and Andrew W. Davis

AIR POLLUTION MONITORING SYSTEM. *(Dept. of the Army, Washington, D. C.) U. S. Pat. 3,715,298. 4p., Feb. 6, 1973. 5 refs. (Appl. Dec. 22, 1970, 11 claims).*

An air pollution monitoring system has been devised to detect and/or quantitate trace amounts of airborne and aerosolized substances in a few seconds and to provide a method for monitoring the difference in level of pollutants in two or more airstreams. The system consists of a surveillance program and declaring program, with the surveillance program comprising reservoir means containing an absorbing solution selected from the following group of materials: a buffer solution of about pH 8, a substrate solution of 2 times 10 to the -4 M butyrylthiocholine iodide in 0.1 M and pH 7.4 tris buffer, 2.0 times 10 to the -4 M thiocholine iodide solution, and sodium sulfite solution. An inlet is in juxtaposition to the reservoir to permit the airstream to enter the system, and an electrochemical cell is adapted to monitor the presence of the pollutants. A conduit having an inside diameter of about 0.070 in. is connected between the inlet, the reservoir, and the electrochemical cell to produce turbulence and permit efficient absorption of the pollutants by the absorbing solution. A pump is also connected within the system to circulate the airstream and absorbing solution. A trap is connected between the electrochemical cell and the pump to collect the absorbing solution after passing through the cell. The declaring program is connected to the electrochemical cell and proclaims the presence of pollutants. This system can measure oxidants, sulfur dioxide, cholinesterase inhibitors, ozone, hydrogen sulfide, hydrazine, nitrogen oxides, and many other compounds.

31824 **APTIC NO. 53894**

Gyglya, V. G., V. Y. Shepelev, and A. A. Zhukhovitsky

DETERMINATION OF SMALL CONCENTRATIONS OF CARBON MONOXIDE BY USING A PYROELECTRIC CATAROMETER. *(Opredeleniye malykh kontsentratsiy okisi ugleroda s primeneniyem piezolektricheskogo katarometra). Text in Russian. Zh. Analit. Khim (Moscow), 28(6):1223-1225, 1973. 1 ref.*

A gas chromatographic method for the determination of carbon monoxide concentrations near the lower limit of detectability (0.00005% vol) by using piezoelectric catarometer is described. The calibration curve is set by according to Lavelok s method. Linear relationship between the peak height and the CO concentration within a concentration range from the lower limit of detectability to about 1% was observed. The reproducibility of the analytical results is + or 2%. The method is suitable for the determination of CO concentrations in closed spaces over extended periods of time.

31825 **APTIC NO. 53904**

Halow, John S. and Susan J. Zeek

PREDICTING RINGELMANN NUMBER AND OPTICAL CHARACTERISTICS OF PLUMES. *J. Air Pollution Control Assoc., 23(8):676-684, Aug. 1973. 14 refs.*

Methods were developed for calculating the Ringelmann number, opacity, and other optical characteristics of stack plumes from information on particulate properties, concentrations, and system geometry. Methods were developed for white plumes caused by water drops or crystalline material and for black plumes containing carbon emissions. The Ringelmann number for white plumes correlated with the physiological sensation of a color difference between the plume and the surrounding blue sky. In the case of black plumes, the data of Conner and Hodkinson correlated best with the plume transmittance. The Mie theory of scattering of light was used to calculate the color difference and transmission needed to relate Ringelmann number to the loading, plume size, particle composition, particle size distribution, and other plume properties needed to specify cleanup equipment. A computer program was written to perform the Mie theory and related calculations. Graphical methods were developed for plumes with log probability size distributions composed of water drops, dusts with refractive index of 1.50, or C type emissions of refractive index 1.59-0.66i. Agreement of Ringelmann numbers predicted by these techniques and those observed for large stacks is excellent. (Author abstract modified)

31826 **APTIC NO. 53911**

Hinkley, E. David and H. Alan Pike

AMBIENT AIR AND SOURCE MONITORING WITH TUNABLE SEMICONDUCTOR LASERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 25p., 1973. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-170.)*

The applicability of tunable semiconductor diode lasers to the detection of gaseous pollutants by resonance absorption in the infrared was studied. Using a diode laser emitting around 10 micron in the infrared, ambient ethylene levels over a total path of 0.5 km over a parking lot were found to exceed 1 ppm during the evening rush hour. In situ measurements of ethylene in automobile exhaust uncovered definite variations in both the absolute value and variance of this hydrocarbon from one vehicle to another, as well as differences brought about by changes in the engine start-stop procedure. A semiconductor diode laser in the 8.9 micron region was used to detect sulfur dioxide in the stack of a coal burning power plant, and the results compared with those of a conventional point sampling instrument. The two wavelength technique can be used to overcome such broadband interferences as particulate scattering, atmospheric turbulence, and broadband absorption. It may be necessary to use two separate lasers to produce the two wavelengths to reduce the effects of high frequency turbulence. Currently, the application of semiconductor diode lasers to problems such as air pollution monitoring is limited by both laser fabrication technology and certain operational requirements. A high level of technology is needed to produce semiconductor crystals with appropriate compositions and lasers with low resistance electrical contacts and optimal laser cavity configurations. Also, most diode lasers require temperatures under 12 K, for which liquid helium is needed. Consideration is being given to closed cycle refrigeration which can produce the required low temperatures without liquid helium. (Author abstract modified)

31827 **APTIC NO. 53798**

Hochrainer, Dieter

ORIENTATION OF PARTICLES IN THE CENTRIFUGAL FIELD. *(Orientierung von Teilchen im Zentrifugalfeld). Text in German. Staub, Reinhaltung Luft, 33(8):320-323, Aug. 1973. 8 refs.*

The measurement of the aerodynamic diameter of non-spherical particles may be influenced if the particle is arbitrary or preferential oriented during sedimentation. Measurements of the orientation of latex double-particles of 0.5 micron diameter have been made with a centrifuge. Assuming, the particles touch the deposition foil in the centrifuge with an orientation, which is representative for the orientation of the airborne particle, and that the particle does not change the orientation after the first touch, then the particles were oriented arbitrarily. This result is made plausible by theoretical considerations.

31828 **APTIC NO. 53625**

Ihida, Mutsumi and Teruaki Ishii

DETERMINATION OF FLUORIDE IN STEELMAKING SLAG AND DUST BY ION-SELECTIVE-ELECTRODE METHOD. *(Ion sentaku denkyokuho ni yoru seiko suragu oyobi baijinrui no fusso no teiryo). Text in Japanese. Nippon Kokan Giho (Tokyo), no. 69:55-60, June 1973. 9 refs.*

The determination of fluoride in steelmaking slag and dust by the ion selective electrode method was investigated. The sample was weighed and fused with sodium peroxide in a nickel crucible and dissolved in water. After the precipitation of hydroxide, part of the solution was taken into a 100 ml beaker where a buffer solution was added to regulate pH. The volume of the portion was adjusted to 100 ml, and the electrodes were dipped into it for the measurement of electromotive force. The amount of fluoride is read out from a calibration curve.

31829 **APTIC NO. 53575**

Lyshkow, Norman A.

METHOD AND APPARATUS FOR ANALYSIS OF GAS STREAMS. *(Assignee not given.) U. S. Pat. 3,712,793. 5p., Jan. 23, 1973. 3 refs. (Appl. Aug. 16, 1971, 27 claims).*

A method and apparatus for the detection and/or analysis of gases by the chemiluminescent technique have been designed to overcome previous failures to provide a chemiluminescent reaction in which the photon events have sufficient intensity to enable them to be detected with any significant degree of accuracy. The concepts of the present invention reside in the discovery that the intensity of the photon events emitted as radiation during the course of a chemiluminescent reaction can be drastically increased by carrying out the reaction as a surface reaction. Hence, in the present invention, a chemiluminescent reaction between a gaseous reactant and a solid, liquid, or gaseous coreactant is carried out by passing at least the gaseous reactant at a high rate of flow through a channel defining a tortuous path whereby a thin layer of the gaseous reactant is subjected to high turbulence for contact with the coreactant. The resultant number of flashes of radiation representing photon events can be measured by known means as a measure of the amount of the gaseous reactant present. This method can be used to determine the amount of ozone or nitrogen dioxide in air.

31830 **APTIC NO. 53600**

Lyshkow, Norman A.

COLORIMETER FOR DETERMINING THE CONCENTRATION OF A POLLUTANT GAS IN AN AIR SAMPLE. *(Pollution Monitors, Inc., Chicago, Ill.) U. S. Pat. 3,708,265. 8p., Jan. 2, 1973 1 ref. (Appl. June 15, 1970, 20 claims).*

A new and improved colorimeter including scrubber and photocell assemblies for use with the device, has been designed for determining the concentration of gaseous pollutants in the air; the apparatus is particularly well suited for monitoring, either continuously or intermittently, the sulfur dioxide content in air using water as an absorbent or nitrogen dioxide using the reagent composition as an absorbent. The scrubber includes a helical coil into which an air sample is drawn and admixed with a liquid absorbent. The liquid flows gravitationally through the coil in the form of wave fronts to provide complete contact between the air sample and liquid absorbent with minimum agitation. The photocell assembly includes a pair of spaced photoresistors and a light source spaced therebetween. The light source has a lamp housing which defines a pair of spaced openings whereby the light source projects optical spots to the photoresistors. The relative intensity is dependent upon the color developed in solutions passed in front of the photoresistors as an indication of the pollutant gas concentration in the air sample. (Author abstract modified)

31831 **APTIC NO. 53626**

Lyshkow, Norman A.

COLORIMETER WITH GAS SCRUBBER ASSEMBLY. *(Pollution Monitors, Inc., Chicago, Ill.) U. S. Pat. 3,712,792. 7p., Jan. 23, 1973. 6 refs. (Appl. June 15, 1970, 6 claims).*

An improved colorimeter for determining the content of various gases such as nitrogen dioxide and sulfur dioxide in air and new scrubber and photocell assemblies have been devised to overcome drift characteristics resulting from temperature and light level instabilities, overly large scrubber volume when avoiding the use of sodium tetrachloromercurate as a trapping solution, and the oxidation of sulfur dioxide to sulfur trioxide when the former is being determined. The scrubber includes a helical coil into which an air sample is drawn and mixed with a liquid absorbent. The liquid flows through the coil in the form of wave fronts to provide complete contact between the air sample and absorbent with minimum agitation. The photocell assembly has its light source enclosed to define a pair of spaced openings which emit optical spots to a pair of spaced photoresistors located on each side. The relative light intensity is dependent upon the color developed in solutions thus giving an indication of the pollutant gas concentration in the air sample. Specific examples of reagent and absorbent composition for NO2 and SO2 are provided. The Saltzman and West-Gaeke reagents can be used for these gases, respectively.

31832 **APTIC NO. 53928**

McKee, Herbert C.

INSTRUMENTAL METHOD PROVES SUPERIOR FOR CONTROL OF VISIBLE EMISSIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 21p., 1973. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-245.)*

A Texas regulation which permits the use of a stack mounted transmissometer instrument as a substitute for the calibrated eyeball estimation of equivalent opacity to evaluate visible emissions is evaluated. Since the Texas Air Control Board adopted the regulation in 1969, approximately 100 instruments were installed in various industrial plants in Texas. Many plant operators and enforcement official prefer this method since it avoids the problems and limitations inherent in the visual estimation of equivalent opacity. Continuous records are obtained on an instantaneous basis to aid in identifying malfunctions of pollution control equipment, and in taking corrective action. Chart records are accepted as proof of compliance, provided only that proper calibration of the instrument can be demonstrated. Unlike visual observation methods, no difficulties are encountered due to darkness, cloud cover, or other adverse meteorological conditions. Some operational problems are encountered such as the need for occasional cleaning of optical surfaces, and also some drift in zero and span adjustments. Recalibration of instruments used in production facilities that run continuously for long periods of time remains a problem; the only completely satisfactory solution at the present time is the use of a new (and more expensive) instrument with an automatic recalibration cycle which rechecks instrument span periodically. A new regulation was adopted which makes the instrumental method mandatory for all sources of visible emissions in Texas which exceed 1,000,000 cu ft/min total gas volume. After additional experience has been obtained, this minimum flow volume may be reduced to 50,000 cu ft/min, which will provide continuous monitoring for a high proportion of the industrial particulate emissions in the state. (Author conclusions modified)

31833 **APTIC NO. 53866**

Naito, Shyoji and Tozo Tamura

THEORY AND PRACTICE OF DERIVATIVE SPECTROMETRY TO THE ANALYSIS OF TRACE GASES. *(Biryogasu sokutei ni okeru shigaisen niji dokansu supekutoru riron to jissai). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(4):413-417, April 1973. 3 refs.*

Derivative spectrometry can be used to analyze trace gases in ambient air and stack gases. It requires no special gas or reagent for calibration, other gases or water do not interfere, and the apparatus is easily portable. An ultraviolet lamp is used as a light source. The wavelength is 1800-7000 A. A photomultiplier is used to detect light. Sulfur dioxide, nitric oxide, nitrogen dioxide, ozone, ammonia, nitrous acid, and various hydrocarbons (C2H4, C6H6, C7H8, C8H8, C8H10, and CH20) were measured.

31834 **APTIC NO. 53884**

Niedrach, Leonard W.

CARBON DIOXIDE SENSOR. *(General Electric Co.) U. S. Pat. 3,730,868. 5p., May 1, 1973. 5 refs. (Appl. Dec. 21, 1970, 3 claims).*

A rugged, dependable, and miniaturized carbon dioxide sensor which is suitable for biomedical, environmental control, and other applications has been developed. The device has an elongated flexible current collector with at least an exterior surface of gold or a noble metal on the collector and an electrochemically active region of a quinone and a hydroquinone in electrical contact with a portion of the current collector. A second elongated flexible current collector surrounds, at least partially, the first collector; and a second electrochemically active region of silver and silver halide is in electrical contact with the second collector. A layer of electrical insulation is situated between the first and second current collectors, and another layer covers the second collector. An anion-exchange resin electrolyte contacts both electrochemically active regions; and an outer sheath of carbon dioxide permeable, ion-impermeable diffusion barrier material encapsulates at least the electrochemically active regions and the electrolyte. The first electrochemically active region provides the sensing electrode, while the second provides a reference electrode. Operationally, a high impedance voltmeter is connected to the respective electrodes, and the terminal voltage from the sensor in operation will be a function of the carbon dioxide partial pressure in equilibrium with it.

31835 **APTIC NO. 53876**

Ohkita, Toshiichi

DETERMINATION OF FLUORIDES IN EMISSION SOURCES AND IN THE ATMOSPHERE, AND THEIR PROBLEMES. *(Endoo haigasu-chu oyobi taiki-chu no fukkabutsu no bunseki to mondaiten). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(4):359-365, April 1973.*

The measurement of fluorides in emission sources and in the atmosphere is described including sampling tube, absorbing solution, filter, analytical methods and instruments, and problems. The use of stainless steel and copper tubes in the sampling of fluorides is not recommended because of the reaction of hydrogen fluoride with these metals. A teflon tube is very useful. The correct selection of a dust filter is very important in obtaining correct data. The continuous automatic measurement of hydrogen fluoride in stack gas with a selective electrode and colorimetry was investigated. The determination of HF is attainable with an absorbing efficiency of almost 100%, even though the gas flow rate is 24 l/min.

31836 **APTIC NO. 53647**

Pierce, Russell W.

APPARATUS AND METHOD FOR DETECTING GASEOUS CONTAMINANTS. *(Assignee not given.) U. S. Pat. 3,718,434. 7p., Feb. 27, 1973. 3 refs. (Appl. Jan. 13, 1972, 24 claims).*

A rapid, sensitive, and relatively inexpensive apparatus for the detection of gaseous contaminants such as sulfur dioxide has been designed to monitor the poisoning effect (and contaminant concentration) by measuring changes in the flow rate for a gas diffusing through a selectively permeable metallic element. The method of detection involves bringing a standard gas stream containing a constant concentration of the diffusible gas into contact with the external diffusing surface of the permeable metal portion of the sensing element and maintaining a lower concentration of the diffusible gas at the internal diffusing surface, thereby creating a partial pressure differential for the diffusible gas across the permeable metal and causing the gas to diffuse through. A sample of the gaseous environment to be tested is mixed with the gas stream coming into contact with the external diffusing surface of the sensing element; and if the sample contains a contaminant, the sensing element will become poisoned and thereby less permeable. The resumption of the non-contaminated diffusible gas stream serves to purge the metallic sensing element and restore its permeability. The flow of diffusible gas through the element may be measured directly or indirectly. The sensing element in the preferred embodiment is made from an alloy containing approximately 60% palladium and 40% copper.

31837 **APTIC NO. 53696**

Rancitelli, L. A.

NEUTRON ACTIVATION ANALYSIS OF COAL AND FLY ASH STANDARDS. *In: Pacific Northwest Laboratory. Annual Report for 1972 to the USAEC Division of Biomedical and Environmental Research. Vol. II. Physical Sciences. Part 2. Radiological Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., p. 56- 57, April 1973.*

NTIS: BNWL-1752 PT2

Coal and fly ash samples were analyzed for 25 major-minor and trace elements by instrumental neutron activation analysis. Samples were irradiated for 1 min in a neutron flux of 10 to the 13th power n/sq cm/sec, then were permitted to decay 10 min prior to germanium (lithium) gamma-ray analysis. This technique permitted direct measurement of aluminum, bromine, chlorine, copper, magnesium, titanium, and vanadium by comparison with standards. Other elements were measured after a second neutron irradiation for 6 hr in a neutron flux of 2 times 10 to the 12th power n/sq cm/sec followed by a 4 or 20-day decay period. All elements with the exception of Mg and those elements at or below the detection limits of the technique (Cl, Br, Cu, and mercury) were measured to an accuracy of 5-10%.

31838 **APTIC NO. 53882**

Salem, Kenneth G.

AIR POLLUTION LIGHT FOR NAKED EYE DETECTION OF INDIVIDUAL SUB- MICRON SIZED PARTICLES. *(Assignee not given.) U. S. Pat. 3,726,593. 4p., April 10, 1973. 1 ref. (Appl. April 22, 1970, 3 claims).*

An apparatus based upon the principle of light scattering has been developed for observing colloid size particles directly with the unaided eye. The device consists of a relatively strong light source having a converging lens and a shield attached at a right angle to the lens in order to block out the light source itself from the eye of the observer when properly positioned. The light source may be a six cell flashlight having D size batteries; and in the present case, a 3 in. converging (convex) lens is attached to the flashlight head which itself is 3 in. in diameter, thereby causing the incident parallel beam of light to come to a point of focus. A half round shield, utilized to give better results, is attached to the head of the flashlight and converges upwards the approximate distance of the focal length of the converging beam of light. The light in the area of convergence, when appropriately viewed from a common angle to the light source, becomes discernible, and scattering of such light by individual particles is then observable.

31839 **APTIC NO. 53642**

Stephenson, John

PARTICLE SEPARATION IN A GASEOUS FLUID. *(United Kingdom Atomic Energy Authority, London (England)) U. S. Pat. 3,724,658. 5p., April 3, 1973. 2 refs. (Appl. March 20, 1970, 4 claims).*

An apparatus for separating particulate matter from a gas, particularly dust from air, has been designed for selective size sampling and also for use as a lung model simulator. Operationally, a continuous steady suction is applied to the outlet duct to induce a flow of air to be sampled into the inlet passage. The entrance to the passage has radiused edges, and the length of the passage in relation to its width is such as to minimize turbulence and ensure substantially laminar flow. As the air stream passes the entrance to the branch duct, a fraction of the air is sucked into the central chamber and proceeds to the outlet through a central region of a filter paper; the remainder proceeds without substantial change of direction through an outer annular region of the filter paper. The relative areas of the inner and outer regions and the parameters of the branch duct are chosen so that about 38% of the air flow enters the central chamber. After a period of operation, the filter paper is removed and the central region is punched out. The mass of the particles deposited in the two regions can be determined by weighing or active particle counting.

31840 **APTIC NO. 53753**

Williamson, James A., Jr.

NO-NO2 ANALYZER. *(E. I. du Pont de Nemours and Co., Wilmington, Del.) U. S. Pat. 3,718,429. 6p., Feb. 27, 1973. 4 refs. (Appl. March 15, 1971, 32 claims).*

A method and apparatus for the photometric analysis of nitric oxide and nitrogen dioxide in a sample gas has been developed that is accurate, reliable, and effective over a wide range of concentrations; the method also allows for the separate analysis of the gases. The sample gas is introduced into a leak-tight pressure sample cell through which visible radiation is passed for the detection of NO2. An oxygen-containing gas is introduced under pressure, and detection is again performed with visible radiation for the combined amounts of NO and NO2. Preferably about 4 atm of pure oxygen is added to about .5 to 1.5 atm of the sample, and radiation below 410 nm, if present, should be excluded. Additionally, a second wavelength of radiation that is less strongly absorbed by NO2 may be used as a reference to compensate for the scattering of such substances as vapor mists and particulate matter. The preferred combination of wavelengths for the more usual concentrations of NO and NO2 is 436 and 546 nm for the detecting and reference radiations, respectively. Controlling the temperature of the sample cell is significant in providing accurate and reproducible results over a large range of concentrations. Generally the cell temperature should be maintained within the range O C to 125 C, with 50 C being the preferred usual temperature. Controlling the pressure within the sample cell further increases the accuracy of the determinations.

1972

31841 **APTIC NO. 53936**

Pilz, W. and S. Komische

THE REMOVAL OF VANADIUM FROM BIOLOGICAL MATERIALS AND FROM THE AIR. *(Die Bestimmung von Vanadium in biologischem Material und Luft). Text in German. Int. J. Environ. Anal. Chem., 1(4):275- 282, May 1972. 2 refs.*

The determination of vanadium in air and in biological materials by salicylhydroxamic acid is discussed. This method was tested by an analysis of human urine and myocardium to which known amounts of vanadium were added. An apparatus for the treatment of biological materials under a weak vacuum and one for the sampling of air are described. The excretion of vanadium in urine under strong exposure conditions, the analysis of body tissues of an exposed person, and an air analysis of fumes from cars and an oil heating system are also discussed.

1971

31842 **APTIC NO. 53718**

Carnes, Richard C.

SPECTROSCOPIC INSTRUMENTATION FOR REMOTE POLLUTION MONITORING. *Preprint, American Society for Metals, Metals Park, Ohio and Society of Manufacturing Engineers, Dearborn, Mich., 21p., 1971. (Presented at the Western Metal and Tool Conference and Exposition, Los Angeles, Calif., March 8-11, 1971, Paper W71-19.1.)*

Three levels of remote sensing instrument systems developed by the Bendix Corp., which are in use for pollution and other monitoring, are reviewed. The first is the Bendix Thermal Mapper an infrared line scanner. The device responds to the relatively long wavelength emittance, or thermal band, infrared energy emanated by a substance in nature. When the infrared scene is scanned by an infrared detector, the resultant video signal may be structured as an image on a cathode ray tube. The value of the data is their discrimination of radiometric temperature differences. The second detection system is a ground based, nonimaging spectrometer which measures the distribution of infrared energy in a given path through the air, according to various wavelengths or optical bands. The natural constituent gases and vapors of the atmosphere absorb infrared radiation selectively according to their molecular structures. The third type of pollution detection system under development combines the line scanner and spectrometer instruments in the multispectral line scanner. This system images in many spectral regions throughout the atmospheric windows and thus combines spectral signature data not only from reflected sun energy but also, coherently, from emitted earth energy. (Author abstract modified)

31843 **APTIC NO. 53812**

Gronsberg, Ye. Sh. and I. V. Gubanova

DETERMINATION OF BENZENESULFONYL CHLORIDE, PARA-CHLOROBENZENESULFONYL CHLORIDE, AND PARA-TOLUENESULFONYL CHLORIDE IN THE AIR. (METHOD). *(Oprdeleniye benzolsul fokhlorida, p-khlorbenzolsul fokhlorida i p-toluolsul fokhlorida v vozdukhe). Text in Russian. Gigiena i Sanit., 21(6):81-83, 1971. 3 refs.*

A colorimetric method for the determination of benzenesulfonyl chloride, para-chlorobenzenesulfonyl chloride, and para-toluenesulfonyl chloride in the air is presented. A total of 3 l of air is sampled at a rate of 10 l/hr through two series Zaytsev absorbers which contain pH 10 buffer solution with acetone for the absorption of para-chlorobenzenesulfonyl chloride and para-toluenesulfonyl chloride, and a buffer with alcohol for the absorption of benzenesulfonyl chloride, respectively. The sample solution is treated with 0.04% solution of auramine for the formation of chloroform-soluble colored auramine compounds. The optic density of the colored solutions is measured at 400-430 nanom through a 1-centimeter thick layer, and the concentration is determined by comparison with a calibration curve. The coloration of para-chlorobenzenesulfonyl chloride solutions of 0 to 30 microgram concentrations obeys the Beer-Lambert law, and so does the coloration of 0 to 40 microgram concentrations of benzenesulfonyl chloride and para-toluenesulfonyl chloride solutions. The sensitivity of the determination amounts to 2.5 micrograms of benzenesulfonyl chloride, and 5 micrograms of para-chlorobenzenesulfonyl chloride and para-toluenesulfonyl chloride in 5 ml solution.

1970

31844 **APTIC NO. 53717**

Davis, Jerry E. and Bill B. Elrod

SIMULTANEOUS QUANTITATIVE SPECTROSCOPIC ANALYSES OF SEVERAL ELEMENTS IN CALCINED ALUMINA. *Preprint, 15p., 1970. 2 refs. (Presented at the Mid-American Symposium on Spectroscopy, 21st Annual, Chicago, Ill., June 2-5, 1970.)*

A procedure for tthe simultaneous quantitative spectroscopic analyses of several elements in calcined alumina is outlined. The equations of the working curves of each element were defined by regression analysis. The analyses were ran with a 10 amp D.C. arc, a 4 mm electrode gap, and a Kodak SA-1 emulsion on a 4 in. by 10 in. plate. The centerpost type of electrode gave the most stable arc. Samples containing a high soda content were run in a controlled atmosphere using a Stallwood Jet to introduce 8 cu ft/hr of oxygen into the burn area. The excitation time was decreased from 2 min to as little as 55 sec. The transmittance was lowered from 50% to 20% by variation of the neutral density filter. In the grades of alumina analyzed, there was no element present that was common to all the possible grades in a constant concentration. Internal standards were necessary, and two were added primarily because of the wide range of wavelengths involved. Indium and germanium were selected and were mixed as the oxides with spectrographically pure graphite to make a flux containing elemental concentrations of 0.00018% Ge and0.0036% In; 6/10 g of the flux and 3/10 g of the sample were mixed in a tungsten carbide vial for 2 min. With a proper choice of internal standards, this approach can be used for the spectrographic analysis of many combinations of elements in a given material.

AIR QUALITY MEASUREMENTS

1973

31845 **APTIC NO. 53736**

Japan Environmental Agency

A REPORT OF THE ANALYTICAL RESULTS OF FLOATING DUST AT NATIONAL AIR POLLUTION MEASURING STATIONS. *(Kokusetsu taiki osen sokuteimo fuyu funjin seibun bunseki kekka hokoku sho). Text in Japanese. 38p., March 1973.*

Suspended dust collected at National Air Pollution Measurement Stations in Japan from April 1972 to March 1973 was analyzed for benzene-soluble substances, water-soluble substances (sulfates and nitrates), and metal components (vanadium, manganese, iron, copper, cobalt, nickel, zinc, cadmium, and lead). Sampling and analytical methods are mentioned.

31846 **APTIC NO. 53652**

Goodman, H. S. and B. B. Hicks

PARTICULATE CONCENTRATIONS IN GROUND-LEVEL AIR ALONG AUSTRALIA S EAST COAST (150 DEG E LONGITUDE). *Clean Air, 7(2):25-28, May 1973. 7 refs.*

Measurements of the total particulate loading of air near the surface were made at six locations in Eastern Australia and Papua, New Guinea, using identical equipment located in large cities. Results from mainland Australia averaged between 40 and 55 micrograms/cu m over the first 18 months (1971-1972) of the program, while both Hobart and Port Moresby appeared to yield significantly lower particulate concentrations. Results obtained from neighboring stations were positively correlated, while negative correlations were sometimes found between those from widely separated stations. These correlations, to a large extent, resulted from a dependence of particulate concentrations on wind direction with the latter being a function of the prevailing weather situation. (Author abstract)

31847 **APTIC NO. 53889**

Hirosawa, Iichiro

REGIONAL POLLUTION BY EMITTED GASES OF ALUMINUM REFINERY. *(Aruminyumu seiren kojo haigasu ni yoru chiiki osen). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(4):347-351, April 1973. 6 refs.*

An aluminum refinery in Japan yields 1,900,000 tons of products a year and emits fluoride compounds. It is located in a long narrow valley with largely southerly winds. Fluorides were measured in red pine leaves and in the ambient air. The leaves were dried, ashed, and analyzed by spectrophotometry. The area to the east of the refinery had an air fluoride content of 20-30 micrograms; the area to the north had 70-80 micrograms of fluoride in the air. The winter had values three or four times larger than the summer. The fluoride content in pine leaves 1 km from the refinery was 150-300 ppm. The northern area had slightly larger values than the southern areas. Plants growing in the northern area had greater damage than those in the southern area.

31848 **APTIC NO. 53870**

Jost, D.

RESULTS OF AIR POLLUTION MONITORING IN FRANKFURT/MAIN. *(Messergebnisse der Ueberwachung der Luftverunreinigung in Frankfurt/Main). Text in German. Preprint, Johann Wolfgang- Goethe-Univ., Frankfurt (West Germany), Inst. fuer Meteorologie und Geophysik, 11p., 1973. (Presented at the Forschungsvereinigung der Feinmechanischen und Optischen Industrie, Cologne, West Germany, April 5, 1973.)*

Since 1958, measurements of the air pollution in Frankfurt have been taken. Out of the first unsystematic studies grew a sophisticated air pollution monitoring system. An illustration of the technology applied at the pilot station Frankfurt is given. The station monitors the sulfur dioxide, nitrogen oxides, carbon dioxide and hydrocarbons. The cumulative frequency distribution of SO2 for 1966 to 1971 shows that during the heating period (October to March) 99% of the values measured 200 ppb or less, while in the months April to September slightly more than 99% of the values measured 75 ppb or less. Domestic heaters contribute 75% to the winter-time average SO2 emissions in the center of Frankfurt/Main. As measurement of the vertical SO2 distribution show, this percentage drops quickly with the altitude. The diurnal characteristic of the carbon monoxide concentration shows the prevailing influence of traffic.

31849 **APTIC NO. 53749**

Lahmann, Erdwin

AIR POLLUTION BY SULFUR DIOXIDE IN THE CITIES OF THE FEDERAL REPUBLIC OF GERMANY - RESULTS FOR THE PERIOD 1969 TO 1972. *(Luftverunreinigung durch Schwefeldioxid in Staedten der Bundesrepublik Deutschland - Ergebnisse von 1969 bis 1972). Text in German. Bundesgesundheitsblatt (Berlin), no. 11:162-165, June 1973. 1 ref.*

The results of atmospheric sulfur dioxide measurements from 27 cities of nine states of the Federal Republic of Germany for the periods fall 1969 to fall 1970, fall 1970 to fall 1971, and fall 1971 to fall 1972 are listed in three tables. The SO2 concentrations measured over the last period were generally lower than in the previous two periods. With some exceptions (Hamburg, Voelklingen) the SO2 concentration went down almost everywhere, most remarkably however in Berlin. From Nov. 1970 to Oct. 1971 the arithmetic annual averages measured in Berlin were 0.157 (Jungfernheide), 0.206 (Steglitz), and 0.120

mg/cu m (Dahlem). For the following period Nov. 1971 to Oct. 1972 the annual arithmetic means obtained from these three stations in Berlin were 0.114, 0.128, and 0.105 mg/cu m.

31850 **APTIC NO. 53699**

Ludwick, J. D., J. A. Young, L. A. Rancitelli, and W. E. Davis

A COMPARISON OF THE PARTICULATE POLLUTANT LEVELS AT PROPOSED BASELINE MONITORING STATIONS. *In: Pacific Northwest Laboratory. Annual Report for 1972 to the USAEC Division of Biomedical and Environmental Research. Vol. II. Physical Sciences. Part 2. Radiological Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., p. 78-80, April 1973.*

NTIS: BNWL-1751 PT2

In a program to determine the most suitable site for a baseline monitoring station in the Pacific Northwest, three sites in western Washington were compared with respect to influence of onshore air flow and periods of constant, clean baseline air. Simultaneous measurements were made of condensation nuclei at the three locations, Quillayute, Mt. Octopus, and Kalaloch, using particulate monitors. Under typical summer weather conditions, Mt. Octopus was cleaner than Quillayute. It had occasional 6-hour periods when only 300 nuclei/cu cm were present, compared to double that level at Quillayute. In addition to generally lower particulate levels, fewer short term, very high pollution sources were evident. Increased frontal passages and associated precipitation in late September markedly reduced particulate levels in both stations. Slash burning operations subsequently raised nuclei counts (5000-15,000 cu cm) until the occurrence of air mass changes. Baseline levels at Kalaloch were 3000 nuclei/ cu cm but rose to 15,000-30,000 cu cm for several-hour intervals due to atmospheric stagnation.

31851 **APTIC NO. 53690**

Volchok, H. L.

THE TROPOSPHERIC BASELINE CONCENTRATION FOR LEAD. *In: Health and Safety Laboratory. Fallout Program. Quarterly Summary Report. (December 1, 1972 through March 1, 1973). Atomic Energy Commission, New York, Health and Safety Lab., TID-4500, 59th Ed., UC-41, p. I-79 to I-87, April 1 1973. 11 refs.*

NTIS: HASL-273

The lowest mean lead concentrations in the urban air in recent years have ranged between a few hundred and a few thousand ng/cu m. The suburban surface air generally contains lower concentrations which are dependent upon the proximity to urban centers and prevailing wind directions. The lowest mean concentrations at the following remote locations ranged from 0.9 to 1.6 ng/cu m: Thule, Greenland; Mauna Loa, Hawaii; Puerto Montt, Chile; Antarctica, Chile; and the South Pole. The marine and arctic atmosphere has been reported to contain levels of lead ranging from 0.3 ng/cu m for Novaya Zemlya to 8.0 ng/cu m for White Mountain, California. In general, data gathered by different laboratories show considerable consistency. The data strongly suggest that the baseline concentration of lead in most of the troposphere is probably 1 + or 0.5 ng/cu m, with 0.5 ng/cu m being the amount that the natural sources of lead on the earth would contribute to the atmosphere.

1972

31852 **APTIC NO. 53788**

Yamate, Noboru and Toshiro Matsumura

LEAD CONTAMINATIONS OF AIR ON STREETS OF THIRTEEN MAJOR CITIES IN JAPAN (JULY-SEPTEMBER, 1971). *(Waga kuni 13 toshi no gairo taiki no en osen ni tsuite). Text in Japanese. Eisei Shikensho Hokoku (Bull. Natl. Inst. Hyg. Sci., Tokyo), no. 90:106-107, 1972. 2 refs.*

The lead concentrations in the air at traffic intersections and at roadsides were investigated for 13 major cities of Japan between July and Sept. 1971. Lead was captured by glass fiber filter paper and was analyzed by polarography. The average lead concentration between 8 am and 6 pm in 13 cities was between 0.65 and 4.55 micrograms/cu m, with a maximum of 4.55 micrograms/cu m in Niigata. Kyoto, Hiroshima, Tokyo, Aomori Nagoya, Yokohama, Kanazawa, Osaka, Kagoshima, and Sendai followed in that order. The lowest average was found in Fukuoka. The traffic amount ranged between 898 cars/5 min in Tokyo and 280 cars/5 min in Yokkaichi. The traffic amount in Niigata was 558/5 min, and in Fukuoka was 439/5 min; there was no set relationship between traffic amount and lead concentration. The ratio of the lead concentration in the air to the traffic amount seemed to be higher in middle-size cities than in large cities. The lead concentration in the air generally decreased by 60% compared to the figures of 1967, but the amount of traffic increased by 20%.

1971

31853 **APTIC NO. 53937**

Mueller, Theodore A.

RESULTS OF PRELIMINARY STUDIES OF THE AIR POLLUTION METEOROLOGY OF LIMITED AREAS IN THE SAN LUIS VALLEY. *N. Mex. Geol. Soc., Field Conf. Guideb., no. 22, p. 179-182, 1971. 2 refs.*

The results of preliminary studies of the air pollution meteorology of limited areas in the San Luis Valley are presented. Monthly averages of concentrations of particulate matter, benzene-solubles, and sulfur trioxide are given for the air over Alamosa, Colorado in 1970. Graphs of daily patterns of the concentrations of carbon monoxide, nitrogen dioxide, total oxidants, and total hydrocarbons are given for Alamosa and Antonito. The major source of pollution in Alamosa was home heating

1970

31854 **APTIC NO. 53713**

De Maio, A., M. Moretti, and E. Sansone

OBSERVATIONS ON AND RESULTS OF MEASUREMENTS OF ATMOSPHERIC CO2 UNDERTAKEN IN SOME ITALIAN LOCALITIES IN THE YEARS 1964, 1965, AND 1966. *(Considerazioni e risultati delle misure di CO2 atmosferico eseguite in alcune localita Italiane negli anni 1964, 1965, e 1966). Text in Italian. Consiglio Nazionale delle Ricerche (Italy), Istituto di Fisica dell Atmosfera, SR 31, 42p., Oct. 1970. 11 refs.*

Results of atmospheric carbon dioxide measurements performed from 1964 to 1966 at sea level in Naples, at 0 to 5000 m altitudes above the Gulf of Salerno, at 2050 m at Cervinia, and at 3400 m at Plateau Rosa are presented. The measurements were performed by an infrared analyzer using as references standard gases prepared volumetrically. Results disclosed that atmospheric CO2 increased over the past 10 years by an annual increment of approximately 0.7 ppm which is identical with findings at Hawaii (1958-63) and at the South Pole. The CO2 concentrations in the standards used varied with time, and appropriate corrections were made. The rather considerable increase in CO2 concentrations in some of the standard reference samples were attributed to effusion, to plastic coating in some of the containers, and to the sampling method. No CO2 concentration gradient existed up to the altitude of 5000 m as some other studies have found; the air strata were perfectly mixed which may be due to the coastal location of Salerno. The yearly cycle was regular with a minimum in August-September and a maximum from January to March, in tune with the vegetation cycle. The summer values were 310 ppm, the winter values 335 ppm.

ATMOSPHERIC INTERACTION

1973

31855 **APTIC NO. 53802**

Ackerman, Bernice

AIRFLOW OVER THE METROPOLITAN AREA OF ST. LOUIS. ***Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 31p., 1973. 14 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-26.)***

The variations in wind field occurring in the planetary boundary layer overriding a large metropolitan area were analyzed based on measurements of wind velocity to 2 km obtained via the double theodolite tracking of pilot balloons from locations around St. Louis. Significant variations in both space and time domains were found on two fair weather afternoons. These may have been produced by synoptic, meso-scale, topographic, or urban forcing, and at least some were induced by local influences. The mean airflow was wavelike in the lower 500 m. The curvature, combined with changes in speed, resulted in net convergence of 0.00005 to 0.00001/sec in the metropolitan areas downwind from the main industrial-commercial complex. In the mean, the wind speed did not vary much with height in these light wind conditions. Above the lowest 100 to 200 m, the winds veered with height in the boundary layer, with maximum turning occurring downwind from the city. Significant changes in wind velocity occurred on fairly short time scales. With suppressed convection, these took the form of relatively long period oscillations which propagated across the area at two-three times the speed of the mean wind. With stronger convection, the oscillations were of short period and could not be tracked across the network. On occasion, an exchange of momentum occurred across the subsidence inversion separating the lower boundary layer from the free atmosphere. (Author abstract)

31856 **APTIC NO. 53834**

Bach, Wilfried

SOLAR IRRADIATION AND ATMOSPHERIC POLLUTION. ***Arch. Meteorol. Geophys. Bioklimatol., Ser. B, 21(1):67-75, 1973. 17 refs.***

Results are given from 30-minute observations of ultraviolet (UV) (0.29 to 0.38 micron) and total solar irradiation (0.3 to 3.0 micron) made on the rooftop of a medium size building in downtown Cincinnati. The one year data are obtained from a pyranometer and a UV radiometer used in conjunction with integrators and printout devices. The UV and total direct solar irradiation data are analyzed in order to detect possible weekly pollution cycles. The average difference between weekday and Sunday values in Cincinnati is 3.6% and 29.2% for total direct and UV irradiation, respectively. Chi-square tests indicate significance of these differences at the 5% and 0.5% levels. Ratios of UV and total solar irradiation are presented as indices of atmospheric opacity and compared with turbidity coefficients. The ratios vary relatively little irrespective of whether the atmosphere seems to be polluted or clean. Apparently the particle size distribution in a polluted atmosphere is no different from that in clean air. The small decrease in the ratio of UV to total solar irradiation for a polluted atmosphere may be due to selective absorption by gaseous pollutants. The UV irradiation curves are used to analyze processes leading to fumigation and photochemical smog formation. Calculation of theoretical UV irradiation curves allows the exact assessment of the magnitude of UV attenuation due to pollutants. This attenuation ranges from 30% in clean to over 80% in smoggy atmospheres.

31857 **APTIC NO. 53635**

Bryan, R. J., R. J. Gordon, and H. Menck

COMPARISON OF HIGH VOLUME AIR FILTER SAMPLES AT VARYING DISTANCES FROM LOS ANGELES FREEWAYS. ***Preprint, Air Pollution Control Assoc., Pittsburgh, Pa. 24p., 1973. 9 refs. (Presented at Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-158.)***

Six high-volume suspended particulate samplers were operated on 10 days over a 3-week period in central Los Angeles. The samplers were placed at distances ranging from about 150 ft to 1/2 mi from a major freeway and at heights ranging from ground level to a seventh floor roof. Analyses were made for total suspended particulates, lead, benzene-soluble organics, and selected polycyclic aromatic hydrocarbons. Significant relationships were found between the contaminants sampled and the distance from freeway and elevation of the samplers. The lead and benzene solubles values for the six sites, however, were fairly closely clustered as compared with similar data from four more widely scattered permanent sampling sites. For these contaminants and probably carbon monoxide, a rough approximation of their longer term concentrations for locations not sampled should be possible by interpolation from traffic density contaminant plots using actual data from other monitoring stations. For epidemiological studies involving long term effects, the coupling of area emissions estimates with ambient sampling data should enable the use of significantly fewer air sampling sites as compared with those studies involving short term effects. More work is necessary to establish exact guidelines. (Author abstract modified)

31858 **APTIC NO. 53828**

Currier, Edwin L., Joseph B. Knox, and Todd V. Crawford

COOLING POND STEAM FOG. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1973. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-126.)*

The environmental effects of the cooling pond operations at two separate power plants were studied to determine the frequency and conditions under which pond-induced steam fog, stratus, and icing occur. The most commonly occurring steam fog is one which extends 100 ft to 2 miles along the ground and eventually dissipates with increasing distance; it does not lift off the ground. It is characterized by index numbers of 20 to 200 and winds of 10 to 25 mph. A second type of fog starts out along the ground and then lifts with increasing distance to form stratus. It extends 200 to 5000 ft along the ground and 1 to 10 miles as stratus, and is characterized by fog index numbers of 30 to 90 and winds of 5 to 10 mph. The third fog type is a stratified cloud which forms over the pond and extends 1 to 10 miles downwind scarcely touching the ground at the downwind edge of the pond. It is usually characterized by fog index numbers of 60 to over 200 and winds of calm to 3 or 4 mph. The steam fog droplets vary in size from 7.5 microns in diameter at the dam to 8 to 10 micron in diameter elsewhere. Ice occurs at ambient air temperatures of 22 F and lower, with build up rates of 0.23 to 13 mm/hr; rim ice forms rather than glaze ice. To estimate fog frequency and extent at other geographical locations, local meteorological data and the monthly mean surface water temperature of the pond must be obtained. From these data the mean hourly frequency of fog index number is calculated for each wind sector. This frequency, multiplied by the probability of fog and stratus occurrences equals the expected hours of fog and stratus occurrence for each wind sector. The results can be compared with the frequency of naturally occurring fog, and the study given the probable extent of the steam fog or stratus.

31859 **APTIC NO. 53811**

Grover, R., J. Maybank, K. Yoshida, and J. R. Plimmer

DROPLET AND VOLATILITY DRIFT HAZARDS FROM PESTICIDE APPLICATION. Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 29p., 1973. 63 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-106.)

As a result of the application of pesticides by the spray deposition of small droplets, two potentially hazardous side effects occur: drift of some fraction of the spray downwind from the swath area; and subsequent evaporation of the pesticide from the deposit, followed by vapor migration. Once airborne, the drift of the droplets will be a function of wind speed, release height, air turbulence, solvent volatility, and drop size, which determines the settling velocity. Droplets of 100 micron or less are liable to considerable drift from the desired spray swath. If the active material is at all volatile, further drift hazards may occur as the result of the blow-off of pesticides adsorbed on soil or dust particles. Once on the target, the vapor pressure of a pesticide is affected by factors such as degree of adsorption, soil moisture content, rate of diffusion, air movement, and temperature. Recent field studies with various forms of 2,4-D have demonstrated that the hazards from vapor losses are far greater than those from droplet drift. Although there is little data on the magnitude of vapor losses from other pesticides under field conditions, significant losses from pesticides of low vapor pressure have been demonstrated. Both the bioecological and economic hazards associated with the presence in the atmosphere of pesticides and their degradation products must be considered. Air monitoring should be undertaken on a more intensive scale and the atmospheric decomposition of the pesticides studied further if their ultimate fate is to be understood. (Author abstract modified)

31860 **APTIC NO. 53797**

Hester, Norman E., Edgar R. Stephens, and O. Clifton Taylor

FLUOROCARBONS IN THE LOS ANGELES BASIN. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1973. 6 refs. (Presented at Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-115.)*

The detection, measurement, and photochemical stabilities of fluorocarbons 11 (fluorotrichloromethane) and 12 (dichlorodifluoromethane) in the greater Los Angeles basin are reported. While this area has high fluorocarbon levels relative to background levels of 40 to 50 ppt, the concentration of fluorocarbons at different locations and at the same location at different times varies greatly with the climatic conditions. The effect of an inversion layer on these concentrations is similar to that observed with other pollutants, in that one can observe a high concentration of fluorocarbons below the inversion, with a rapid drop in concentration as one passes above its boundary. The ratio of the average concentration of fluorocarbon 12 to that of fluorocarbon 11 was 1.29 for the outdoor samples; this corresponds to a weight ratio of 1.1 grams of fluorocarbon 12 per gram of fluorocarbon 11. The fluorocarbon levels in homes and in the immediate vicinities of factories where they are used may be as high as 0.5 ppm; their threshold limit value is 1000 ppm. In polluted air, fluorocarbons are photochemically stable, showing no degradation even when exposed for several weeks during a laboratory photolysis study. (Author summary modified)

31861 **APTIC NO. 53762**

Hoydysh, Walter G. and Peter C. Freudenthal

DISPERSION OF EMISSION FROM LOCAL SPACE HEATING BOILERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 36p., 1973. 10 refs. (Presented at Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-121.)*

The effect of emissions from local space heating boilers on ambient air quality in an urban area was estimated using scale model wind tunnel experiments. The model consisted of a five by six block area of central Manhattan in New York City constructed to scale and including a chimney on each building. Smoke and a tracer gas were emitted from each chimney at a rate approximately proportional to the January fuel consumption rate for each building, and the effect on the ambient air quality was determined by means of smoke trace photography and sulfur dioxide tracer gas measurements. A modified Froude number similitude was followed. Local buildings in the test area increased ground level SO2 concentrations by 0.001 to 0.027 ppm above background levels, depending on wind speed. Rooftop concentrations up to 0.55 ppm above background were measured. The building wake effects were obserbed to produce significant aerodynamic downwash, resulting in a highly irregular three dimensional pollution profile which includes regions of locally high pollution concentrations. Good comparison with field data was obtained. (Author abstract modified)

31862 **APTIC NO. 53912**

Juris, Kenneth

A SIMPLIFIED METHOD FOR DETERMINING DRIFT RATES FROM COOLING TOWERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 9p., 1973. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-124.)*

A simplified method to accurately determine drift rates from cooling towers is described. The proposed method requires a temporary shutoff of the blowdown and the subsequent monitoring of the dissolved solids concentration in the circulating water as function of time. The increase in dissolved solids concentration in the tower as a function of time can be uniquely related to the drift rate. The method is applicable to both natural draft and mechanical draft cooling towers and is expected to be applicable to spray ponds for which no suitable technique at present exists for determining drift rates. (Author abstract modified)

31863 **APTIC NO. 53692**

Larsen, Ralph I.

AIR QUALITY FREQUENCY DISTRIBUTIONS AND METEOROLOGY. *Preprint, North Atlantic Treaty Organization, 15p., 1973. 17 refs. (Presented at the North Atlantic Treaty Organization, Committee on the Challenges of Modern Society, Panel on Modeling, 4th Meeting, Oberursel, West Germany, May 28-30, 1973.)*

Ambient air pollutant concentrations are a time function of the strength, height, and distribution of pollutant sources and meteorologic variables such as stability and wind speed and direction: frequency distributions of these concentrations are skewed. Various mathematical functions, particularly the lognormal, have been used to describe these skewed distributions. The cumulative frequency distributions of inverse wind speed and pollutant concentration plot as parallel straight lines on lognormal graph paper, confirming that concentration is inversely proportional to wind speed and indicating that the standard geometric deviations for these two variables are the same. Pollutant concentrations calculated with a Gaussian multiple source urban dispersion model also fit lognormality. Calculated and observed cumulative frequency distributions in one study plotted as parallel straight lines and were within a factor of two of each other for almost all of the 40 sites studied. Factor analysis, eigenvectors, adaptive pattern classification, and various empirical approaches have simplified the characterization and prediction of air pollutant concentration as a function of meteorologic and other variables. (Author abstract modified)

31864 **APTIC NO. 53916**

Macomber, Edward M. and Joe O. Ledbetter

A DRAINAGE WIND FLOW MODEL. Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1973. 9 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-136.)

A method of predetermining drainage wind velocities is derived in the form of an incremental velocity model. The model requires topographical data and a general description of surface roughness. Using these fixed inputs, the model yields velocity factors. Velocity factors are determined as a function of height above the terrain and elapsed time since the occurrence of the maximum surface temperature. When multiplied by a cooling factor, the velocity factors yield velocities. Time or space mean velocities may be found by summation techniques. By computing velocity factors for several points within an area of concern, drainage flow patterns are determined, and pollution movements are readily determined for a given night. (Author abstract modified)

31865 **APTIC NO. 53670**

Rouse, Wayne R., Donald Noad, and John McCutcheon

RADIATION, TEMPERATURE AND ATMOSPHERIC EMISSIVITIES IN A POLLUTED URBAN ATMOSPHERE AT HAMILTON, ONTARIO. *J. Appl. Meteorol., 12(5):798-807, Aug. 1973. 9 refs.*

Simultaneous measurements of global solar and incoming long-wave radiation were presented for roof-top sites in a heavily polluted zone and relatively clean control sites in and around Hamilton, Canada. The measurements were taken intermittently under clear skies over a 3-year period. During part of the study vertical temperature profiles were measured between 150 and 2500 m in the industrial and control atmospheres. Solar radiation was strongly attenuated by the industrial atmosphere, and the daytime incoming infrared flux was increased so that the latter generally compensated fully for the former and the total radiation reaching the ground was similar at both the industrial and control sites. Vertical temperature profiles showed that an elevated inversion develops anywhere between 1070 and 1980 m in the industrial atmosphere depending on the season. Prior to early afternoon, the inversion weakens and moves upward, but in the late afternoon it strengthens and descends. The rate of atmospheric temperature changes beneath the elevated inversion was substantially greater than in the control atmosphere. An hypothesis was advanced that heavy particulate concentrations in the atmosphere of Hamilton play a dual role in absorbing and reflecting solar radiation and that absorbed outgoing infrared radiation is rapidly dissipated. This hypothesis is supported by the fact that average atmospheric temperatures in industrial and control atmospheres do not differ significantly. (Author abstract)

31866 **APTIC NO. 53627**

Senshu, Toshio, Shinji Kakishima, and Sho Nishinomiya

ON THE RELATION BETWEEN METEOROLOGICAL PARAMETERS AND THE CONCENTRATION OF SMOKE DISCHARGED FROM A TALL STACK. *(Ko-engen karano haien chijo nodo to kisho inshi no kankei ni tsuite). Text in Japanese. Electric Power Industry (Japan), Central Research Inst., 33p., March 1973.*

The diffusion of smoke released into the atmosphere from a tall stack of a thermal power station is described by meteorological parameters such as wind direction, wind velocity, atmospheric stability, and turbulence which vary in time and space. The data were analyzed using the uniform model theory so that the adaptability between the theory and the observation was inspected. The vertical diffusion coefficient Cz decreases as the wind increases, while Cz increases slightly in an unstable atmosphere compared within the stable one. The lateral diffusion coefficient Cy scarcely depends on both the wind speed and stability. The coefficient ratio Cz/Cy is estimated by making use of the maximum concentration on the surface as well as by the vertical and lateral diffusion coefficient itself described above. Let the former be (Cz/Cy)A and the latter be (Cz/Cy)R; then the ratio lambda is equal to (Cz/Cy)A/(Cz/Cy)R and is two in the calm condition and below one in the strong wind condition.

31867 **APTIC NO. 53799**

Stuemke, Hermann

DISPERSION OF STACK GASES IN A PLANE WITH A VALLEY OR BASIN PERPENDICULAR TO THE WIND DIRECTION. - PART I. *(Ausbreitung von Schornsteingasen ueber einer Ebene mit quer zum Windfeld eingeschnittenem Tal oder Talkessel - Teil I.). Text in German. Staub, Reinhaltung Luft, 33(8):323-327, Aug. 1973.*

As a first approximation, the following configuration is assumed: a horizontal plane is interrupted by a rectangular valley-like depression of arbitrary length perpendicular to the x-axis. This axis gives the mean direction of an uniform parallel flow above the plane, whereas in the valley the gas is, in the mean, at rest. In the valley the turbulent diffusion in x-direction takes the place of the directed mass transport in the upper stream. With the help of the difference method seven characteristic examples are calculated, where the position of the source (in front, over or in the valley) is varied as well as the depth and the length of the valley. The examples cannot be extended quantitatively to other cases, however one may derive some qualitative conclusions. Especially it appears that for sources of noxious gases in or over the valley, the case of diffusion considered here is much more critical than the case of a parallel stream in a very long valley.

31868 **APTIC NO. 53923**

Thuillier, R., J. Sandberg, W. Siu, and M. Feldstein

SUSPENDED PARTICULATE AND RELATIVE HUMIDITY AS RELATED TO VISIBILITY REDUCTION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 22p., 1973. 10 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-138.)*

Theoretical factors determining visibility are discussed in terms of light scattering, absorption, particle size, and refraction index. Visibility measurement problems include subjectivity, terrain, and mesoscale variation. Measurements of total suspended particulate and coefficient of haze (COH) taken in San Jose, Calif. are compared with visibility and relative humidity (RH) measurements taken at San Jose municipal airport. Since a diurnal pattern often characterizes local visibility, the COH values, for which hourly values could be derived from continuously recording instruments, provided the particulate index for comparison. The relationship of COH values and relative humidity to visibility was examined for various categories of each. Summer data grouped by relative humidity classes show that an airport visibility of 10 mi is observed with a 1-hour COH value of 1.0 at RH less than 40%, with a 0.7 COH at RH of 40 to 69%, and with a 0.3 COH at RH of 70% or greater. The importance of RH in this relationship presents a problem in that particulate values given daily to the public may be very poorly related to visibility restriction. Some public information emphasis must be given to the fact that a 30% increase in RH can counterbalance a 70% decrease in measured particulate. This difference is at the 10 mi visibility value established as a California State Standard for all relative humidities below 70%. (Author abstract modified)

31869 **APTIC NO. 53940**

Wangler, T. P. and A. D. Rossin

EFFECTIVENESS OF A HYPOTHETICAL AIR-POLLUTION EPISODE-CONTROL STRATEGY FOR TWO

CHICAGO EPISODES. Argonne National Lab., Ill., Center for Environmental Studies, 65p., Jan. 1973. 15 refs.

NTIS: ANL/ES-24

The Argonne Integrated-puff and Steady-state Plume Models have been used to study the potential effectiveness of imposing an idealized abatement strategy during sulfur dioxide episode conditions. The strategy was tested for episodes that occurred on Feb. 25-26, 1967 and Nov. 5-11, 1969 in the Chicago region. The Feb. 25-26 episode was characterized by concentrations in excess of the present 3 hr, 0.50 ppm SO2 standard at two telemetered air monitoring (TAM) stations and by concentrations in excess of the present 24 hr, 0.14 ppm primary standard at four TAM stations. Comparison of the results of the model using no strategy with the implementation of an episode-control strategy (in which power-plant emissions were reduced by 100%, industrial emissions by 50%, and residential/commercial emissions by 10%, simulating a very idealized first stage, or Yellow Alert action) indicated a 65% reduction in emissions but only a 33% reduction in average concentrations due to the effect of high stacks of larger sources and the geographical distribution of various types of sources relative to the wind direction. Comparison of the calculated concentrations, with and without the idealized Yellow Alert strategy, for the Nov. 5-11 episode revealed an average reduction from 0.08 to 0.05 ppm over a 6 day period. Sixty-one of the 64 grid points that exceeded the 24-hr primary standard of 0.14 ppm in the calculations were reduced to below 0.14 ppm, although 23 exceeded the 0.10 ppm secondary level. Both episodes showed more violations of the 24-hour SO2 air quality standards than of the 3-hour standard. This result appears to hold for both the calculations and for the real data. The 24-hour secondary standard of 0.10 ppm appears in both cases as a difficult standard to meet, even after imposition of the first stage of an idealized episode-control strategy. (Author summary modified)

31870 **APTIC NO. 53698**

Young, J. A., T. M. Tanner, C. W. Thomas, and N. A. Wogman

TRACER AND POLLUTION STUDIES DURING METROMEX. *In: Pacific Northwest Laboratory. Annual Report for 1972 to the USAEC Division of Biomedical and Environmental Research. Vol. II. Physical Sciences. Part 2. Radiological Sciences. Battelle Memorial Inst., Richland Wash., Pacific Northwest Labs., p. 72-74, April 1973.*

NTIS: BNWL-1751 PT2

The Metropolitan Meteorological Experiment (METROMEX) is a study of convective storms in the St. Louis area from 1971-1976. In one of two main METROMEX experiments conducted during the summer of 1972, six inert tracers were sequentially released at 10-13.5 thousand feet near the upwind edge of convective towers to measure the amount of air penetrating them and reaching the region of precipitation scavenging. Following tracer release, rain samples were collected using a newwork of 122 samplers. The samples were analyzed by neutron activation for the tracer and for other elements. Most samples collected 10-20 miles downwind of gold, iridium, and tantalum releases contained measurable quantities of these tracers. Other trace elements measured were cobalt, chromium, iron, hafnium, scandium, samarium, and thorium. The second experiment was the measurement of the trace element composition of air filter aerosol samples collected in the St. Louis area. Samples analyzed by x-ray fluorescence contained lead and bromine produced primarily by automobile exhaust. Lead concentrations were 140-800 ng/cu m in downtown St. Louis and 360/510 ng/cu m 20 miles east and downwind of the city. The highest concentrations (to 3500 ng/cu m) were measured east of the city near Interstate Highway 70. Bromine concentrations were generally one quarter of the lead concentrations. (Author abstract modified)

1972

31871 **APTIC NO. 53726**

Andreyev, S. D., V. Ye. Zuev, L. S. Ivlev, M. V. Kabanov, and Yu. A. Pkhalagov

CERTAIN CHARACTERISTICS OF SPECTRAL TRANSMISSION OF ATMOSPHERIC HAZES IN THE VISIBLE AND INFRARED. *(Izv. Akad. Nauk SSR, Fiz. Atmosfery i Okeana, 9(12):735-738, Dec. 1972. 18 refs.*

The spectral transparency of atmospheric haze between 0.59 and 12.0 micron was measured, as were the microphysical properties of the dry aerosol. The comparison of the aerosol extinction coefficients derived from the optical and microphysical data was analyzed.

31872 **APTIC NO. 53956**

Ware, G. W., B. J. Estesen, W. P. Cahill, and K. R. Frost

PESTICIDE DRIFT V. VERTICAL DRIFT FROM AERIAL SPRAY APPLICATIONS. *J. Econ. Entomol., 590-592, April 1972. 10 refs.*

Vertical drift, or upward loss of aerially applied sprays was measured by cascade air samplers suspended from helium-filled weather balloons. Measurable quantities of an added fluorescent dye were collected from one to 150 ft altitudes, 82 to 660 ft downwind. The greater the altitude, the less the drift, except at the station nearest application, where the greatest drift was detected in the highest sampler. About 24% of the drift spray volume was in the respirable particle size. Further findings included measurements of 49.6% and 84.2% for on-target deposits the differences correlating with air movement during application. (Author abstract modified)

1971

31873 **APTIC NO. 53933**

Fortak, H.

PHYSICAL PROBLEMS OF ATMOSPHERIC POLLUTION. *(Physikalische Probleme der Luftverschmutzung). Text in German. Phys. 1971, Plenarvortr. Physikertag, 36th, Essen, West Germany, p. 153-188, 1971. 14 refs.*

Problems related to the mathematical-physical simulation of air pollution situations are discussed. They involve problems of the physics of planetary boundary layer, the thermal convection, atmospheric movement, and the physical-chemical-reciprocal effect. The use of relatively simple simulation models appears possible in the finding of solutions to various air pollution problems.

BASIC SCIENCE AND TECHNOLOGY

1973

31874 **APTIC NO. 53754**

Arrowsmith, A., A. B. Hedley, and J. M. Beer

PARTICLE FORMATION FROM NH3-SO2-H2O-AIR GAS PHASE REACTIONS. *Nature Phys. Sci., vol. 244:104-105, Aug. 13, 1973. 6 refs.*

Measurement of the formation of particulates from the interaction of ammonia and sulfur dioxide, in equal concentrations and water vapor at partial pressures of 12-250 kN/sq m in air, as they passed through a duct at room temperature, was performed to provide experimental information of gas-particle conversion in the NH3-SO2 system and the effect of humidity on the scheme. The experimentally observed concentrations of particles agreed well with previously reported values for similar concentrations of ammonia and sulfur dioxide. The observed particle sizes were, however, an order of magnitude greater than those previously reported. This suggests a difference between the reaction time of seconds in the duct and the unreported reaction time of the previous experiments or different particle growth mechanisms resulting from the water present in this experiment. Although there was an agreement between the observed rates of particle formation and those predicted by heteromolecular nucleation theory, the concentrations considered in this study and one involving heteromolecular nucleation of the sulfuric acid-water system were considerably different and should not be compared directly. The experimental results illustrate, however, the importance of gas phase reactions between NH3 and SO2 leading to particle formation in atmospheric chemistry by comparison with the aqueous phase reactions previously considered and the rate-determining role played by the water concentration in such conversions.

31875 **APTIC NO. 53840**

Bergman, Dave

UNIQUE CHARACTERISTICS OF EXHAUST-PLUME INTERFERENCE. *J. Aircraft, 10(8):508-511, Aug. 1973. 21 refs.*

Jet engine exhaust plume aerodynamic interference on nozzle drag is a function of plume entrainment as well as plume shape. In some situations, certain solid bodies, with narrower shapes than might be expected, can be used in place of plumes to simulate plume interference on drag. There are also some nozzle geometry and pressure ratio conditions in which solid bodies cannot simulate exhaust plume interference. The drag of isolated, smoothly contoured nozzles with typical exhaust conditions is significantly affected by plume interference at nozzle length to diameter ratios below 4. Of the nozzle configurations considered, length to diameter ratios from 1.5 to 2 produce the least amount of pressure plus friction drag. (Author conclusions modified)

31876 **APTIC NO. 53756**

Borho, Klaus

ON THE PROBLEM OF THE DISPERSION OF DUSTS. *(Zum Problem des Dispergierens von Staeuben). Text in German. Staub, Reinhaltung Luft, 33(8):317-319, Aug. 1973. 7 refs.*

The particle size distribution of limestone dust generated by an aerosol generator was directly measured in a test channel by a scattered light apparatus for different concentrations and for different humidities of the air used for atomizing. At the same time the distribution of electrostatic charging was also determined. In all cases a direct relationship was found between the particle size distribution and the amount of the atomized dust and air moisture. This is caused by the change in the electrostatic charging occurring with different humidities of the atomizing air, and by the change in the dust coagulation associated with it.

31877 **APTIC NO. 53829**

Gitchell, Alice, R. Simonaitis, and Julian Heicklen

THE INHIBITION OF PHOTOCHEMICAL SMOG. I. INHIBITION BY PHENOL, BENZALDEHYDE, AND ANILINE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 22p., 1973. 17 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-112.)*

The use of phenol, benzaldehyde, and aniline as inhibitors in the photochemical oxidation of nitrogen oxide to nitrogen dioxide was studied. All three compounds were able to inhibit the reaction, with phenol being the most efficient inhibitor, and aniline being the least efficient. By extension, compounds such as (C6H5)2NH and (C6H5)3CH might be practical inhibitors under atmospheric conditions where the olefin pressure is less than the 16 m torr used in this study. Presumably, the mechanism of the inhibition involves the reaction of the inhibitor with hydroxyl radicals to produce water: the resulting radicals would then react with NO or NO2, or would react further with atmospheric constituents before reacting with NO or NO2. With regard to the practical possibilities of using additives in the atmosphere to inhibit photochemical smog, the inhibitor concentrations which would be required in real atmospheres would have to be determined. The toxicity of the additive and its reaction products would also have to be considered; neither phenol nor benzaldehyde would be likely to be acceptable additives because of their potential toxicity in the concentrations required. Finally, if an effective inhibitor which did not introduce a health hazard into the atmosphere were to be found, the political feasibility of introducing additives to the atmosphere would have to be considered.

31878 **APTIC NO. 53734**

Hauck, Helger

STUDY OF THE COAGULATION OF AEROSOLS. *(Untersuchungen ueber die Koagulation von Aerosolen). Text in German. Staub, Reinhaltung Luft, 33(8):313-317, Aug. 1973. 29 refs.*

The principal derivations describing the coagulation of aerosols were modified and brought into agreement with the experimental system. The resulting integrodifferentialequations were solved approximately by a computer program. To verify the solutions, a dibutylphthalat-aerosol produced by a La Mer generator was fed into a vertical tube to achieve controlled coagulation in an equilibrium state. The size-distribution function of the system was measured for several points in time by means of a spiral duct centrifuge. Theoretical prediction and experimental results are compared and a reasonable agreement is found.

31879 **APTIC NO. 53761**

Hoshino, Kiyoshi

DEVELOPMENT OF A SULFUR DETERMINATION FOR PETROLEUM BY HIGH TEMPERATURE-COULOMETRIC METHOD. *(Koon nensho, kurometori ni yoru yuchu zen io teiryo sochi no kaihatsu). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 22(7):866-872, July 1973. 6 refs.*

An automatic apparatus for the rapid and accurate determination of the amount of sulfur in petroleum was developed. A modified sulfur analyzer for iron and steel, which is based on high temperature combustion by high frequency induction heating combined with coulometric titration was utilized to burn the petroleum sample. All the gaseous sulfur formed by the combustion was carried into the absorption solution without condensing on the wall of the tubing. This was insured by the use of a special flushing device, automatic recirculation, and by a special technique of treating the tube. The sample was placed in a small cup, weighed, placed in a crucible, and then covered with a layer of iron power, a layer of aluminum oxide, and a layer of iron power. A program control function was added to the high frequency power supply. At the beginning of the combustion, the heating power was set to a low value so that the burning took place at a low temperature. The heating power was then increased gradually until maximum power was reached and maintained. A special combustion chamber with a spiral tube was used. This increased the path in the heated zone, ensuring the complete burning of the fine mist of the sample which escaped from the crucible on combustion. With this apparatus the determination can be made automatically with high precision in 8 to 15 min. The repeatability for the residual fuel oil (mass fraction of sulfur equals 2.5% S) was 0.85% as coefficient of variation. The values of sulfur contents in petroleum obtained by this method agrees well with those obtained by the standard method.

31880 **APTIC NO. 53907**

Killgoar, P. C., Jr., G. E. Leroi, W. A. Chupka, and J. Berkowitz

PHOTOIONIZATION STUDY OF NO2. I. THE IONIZATION POTENTIAL. *J. Chem. Phys., 59(3):1370-1373, Aug. 1, 1973. 22 refs.*

The ionization potential of nitrogen dioxide was redetermined by photoionization mass spectrometry. The experimental apparatus consisted of a vacuum ultraviolet monochromator coupled with a 60 deg magnetic sector mass spectrometer. The grating used is ruled with 1200 lines/mm and has a reciprocal dispersion of 8.3 angstroms/mm. A relatively large slit width of 100 micron was used in the threshold region due to the extremely low cross section encountered. The argon continuum produced by a pulsed discharge served as the photon source, and photon detection was accomplished using a nickel photocathode which had been previously calibrated against a freshly prepared sodium salicylate phosphor. A photoionization cell which could be cooled was employed in order to eliminate spurious effects from hot band structure. The photoionization efficiency curve exhibits autoionization in the threshold region, allowing the assignment of an uppper limit on the ionization potential of 9.62 eV. The result combined with the results of other groups brackets the ionization potential between 9.62 and 9.25 eV, most probably closer to the upper limit. (Author abstract modified)

31881 **APTIC NO. 53795**

Mandl, R. H., L. H. Weinstein, D. C. McCune, and Monica Keveny

A CYLINDRICAL, OPEN-TOP CHAMBER FOR THE EXPOSURE OF PLANTS TO AIR POLLUTANTS IN THE FIELD. *J. Environ. Quality, 2(3):371-376, July-Sept. 1973. 20 refs.*

A cylindrical open top chamber of modular design for the exposure of plants to air pollutants is described. Each module is 1.22 m (4 ft) high and 2.74 m (9 ft) in diameter, and can be stacked vertically in combination of 1, 2, or 3 modules. The modules are fabricated from corrugated fiberglass panels attached to aluminum hoops and the air delivery plenum from lay flat polyethylene tubing. A mobile air filter and flower assembly provides air that has passed through a dust filter and an activated charcoal filter. An open plastic mesh placed across the top of the chamber reduces the influences of wind on the air distribution system, but it does not impede the entrance of precipitation or of insects. The chamber was tested in several ways: efficiency of the chamber and filter flower assembly for exclusion of ambient oxidants was tested by monitoring the atmosphere and by growing susceptible plants in chambers with or without charcoal filters and in outside plots; distribution and concentration of an introduced pollutant within the chamber were measured by a dynamic air monitoring method; and accumulation of an introduced pollutant was studied with both plants and a static monitoring method. (Author abstract modified)

31882 **APTIC NO. 53857**

Vaska, L. and Hisashi Nakai

REVERSIBLE ADDITION OF NITRIC OXIDE TO A SOLID FERRIC PORPHINATO COMPLEX. THERMODYNAMICS OF FORMATION AND CHARACTERIZATION OF A PECULIAR NO ADDUCT. *J. Am. Chem. Soc., 95(16):5431-5432, Aug. 8, 1973. 17 refs.*

The thermodynamics of the reversible addition of nitric oxide to a solid ferric porphinato complex and the characterization of a perculiar NO adduct are described. The unusual interaction involves chloretetraphenylporphinato iron (III) ((FeCl(TPP)) and NO, producing a weak bonded NO addition compound which rapidly reverts to the starting material on removal of NO from the environment: ((FeCl(TPP)) (s) (l) + NO (g) yields ((NO)FeCl(TPP)) (s) (2) in a reversible reaction. The thermodynamics were determined by measuring the equilibrium NO pressure (220-685 nm) as a function of temperature (25-70 deg) squared. At 25 deg, the calculated parameters are Kp, 3.45/atm, delta G equals -0.74 (0.03) kcal/mol, delta H equals 5.26 (0.14) kcal/mol, and delta S equals -15 (0.5) eu. The spectral properties of the NO adduct are unexpected: no change in the iron-chlorine stretching frequency accompanies the reaction; in both compounds 1 and 2, VFeCl equals 378 cm to the -15; there is no significant change in the electronic spectrum in the 400-1000-nm region when NO is added to a degassed CH2Cl2 solution of (FeCl(TPP)); however, a new weak band at 300 nm and a stronger one near 250 nm are observed; the infrared spectrum of compound 2 shows a strong absorption band at 1881/cm assignable to coordinated VNO, but which only slightly differs from the corresponding value of gaseous nitric oxide, 1876/cm. There is another new band at 680/cm which may derive from VFe-NO.

1972

31883 **APTIC NO. 53752**

Koenig, Hanns-Christof

THERMODYNAMIC AND REACTION KINETIC ANALYSIS OF THE COMBUSTION IN OTTO ENGINES. *(Thermodynamische und reaktionskinetische Analyse der Verbrennung in Ottomotoren). Text in German. Technische Univ. Carolo-Wilhelmina (West Germany), Fakultaet fuer Maschinenbau und Elektrotechnik, Thesis (Ph.D.), Braunschweig, West Germany, 1972, 115p., 64 refs.*

A model for the combustion process in Otto (spark ignition) engines is described. This model is based on the assumption that the reaction has a certain space demand and that the combustion process is characterized by the expansion of a volume and the temporal development of the chemical reaction. The reaction volume is defined as the section of the combustion chamber occupied by the combustion. The degree of conversion is included in the calculation as an open parameter. A system of equations describes the properties of the thermodynamic system formed by the contents of the combustion chamber. The thermodynamic system comprises the burned and partially burned part of the combustion chamber contents. An evaluation of the experimental pressure/time characteristics of the combustion at various operating conditions of the engine (mixing ratio, rpm) on the basis of this model and necessary assumptions concerning the properties of the operating medium (ideal gas, equilibrium composition is supplied by the temporal dependence of the parameters influencing the combustion (mass-, energy conversion, temperature). Reaction analysis by means of a gross reaction scheme provides the possibility of interpreting the mechanism of the processes. Numerical results depend very much on the accuracy of the measured values. High demands, which can generally not be fulfilled, are placed on the accuracy of the pressure measurement.

31884 **APTIC NO. 53945**

Kondratiev, V. N.

RATE CONSTANTS OF GAS PHASE REACTIONS. REFERENCE BOOK. *Academy of Sciences (USSR), Order-of-Lenin Inst. of Chemical Physics. 1805 refs. Translated from Russian by L. J. Holtschlag and edited by R. M. Fristrom, Johns Hopkins Univ., Applied Physics Lab., National Bureau of Standards Reference Data System, 434p., Jan. 1972.*

NTIS: COM-72-10014

A survey of the kinetics of bimolecular and termolecular reactions is presented. Literature on the subject is covered to the end of 1969. Gas-phase reactions of neutral particles were surveyed, rate constants presented in consistent units, and a number of reactions were critically evaluated. A table of equilibrium constants is added, as well as a bibliography of rate constant compilations and sources of evaluated kinetic information. Atom reactions, radical reactions, reactions of saturated molecules and electronically excited particles are all reviewed. Thermodynamic tables are given, and programs concerned with the collection and evaluation of chemical kinetic data are discussed.

1971

31885 **APTIC NO. 53953**

Esposito, George G.

RAPID DETERMINATION OF AROMATIC SOLVENTS IN ENAMEL SOLVENTS AND THINNERS. (FINAL REPORT). *Army Aberdeen Research and Development Center, Aberdeen Proving Ground, Md., Coating and Chemical Lab., AMCMS 502E.11.29500, Proj. 1TO62105A329, CCL 295, 13p., Sept. 1971. 13 refs.*

NTIS, DDC: AD 731790

Some organic solvents react with their environment to produce photochemical smog. Under Rule 66, most common aromatic solvents fall into a restricted class, and military and government paint specifications are presently being revised to comply with these air pollution regulations. A rapid, accurate procedure is presented here to determine the composition of organic solvents with the use of a single gas chromatographic analysis. Phenylcyclohexane (0.3 ml) is added to 3 ml of distillate, and sulfuric acid is then introduced to the flask. The distillate is washed free of acid and subjected to the chromatographic analysis. Results from these tests show that oxygenated solvents can be removed by acid extraction without affecting the aromatic solvents and the internal standard. This procedure presents a broad base for the quality control of paint solvents by facilitating accurate compositon assurance of solvents and thinners.

1949

31886 **APTIC NO. 53701**

McCord, Carey P. and William N. Witheridge

THE ANATOMY OF THE OLFACTORY SYSTEM. *In: Odors - Physiology and Control. New York, McGraw-Hill, 1949, Chapt. 1, p. 5-18. 2 refs.*

The physiology of odor perception is described within the context of the following four anatomic arrangements: tissues concerned in the odor stimulus perception, the vomeronasal nerve and Jacobson's organ, the tissues involved in the translation into awareness of consciousness, and the trigeminal nerve. Pictures and diagrams are provided for: dorsal and ventral aspects of the opossum brain (more than one-third of which is dedicated to olfaction and, hence, useful as a study model); the site of human olfactory mucosa; a vertical section of human olfactory mucous membrane prepared by silver technique; a stereogram of olfactory epithelium; location of the human olfactory bulb; zones within the olfactory bulb of the opossum; the structure of the olfactory bulb of the adult rat; relations of the olfactory nerve fibers to the neurons of the second order in the olfactory bulb; median section of the opossum head to show the course and connections of the vomeronasal nerves; and reconstruction of human rhinencephalon as seen from above and a ventromedial view of the right cerebrum.

EFFECTS-HUMAN HEALTH

1973

31887 **APTIC NO. 53727**

Kawasaki City Medical Assoc. (Japan)

AN INVESTIGATION OF POLLUTION VICTIMS SYMPTOMS BASED ON LOGS KEPT BY ASTHMATIC PATIENTS, AND THEIR RELATIONSHIP WITH AIR POLLUTION. PART II (1971). *(Zensoku nisshi ni yoru kogai higai nintei kanja no shojo chosa oyobi taiki osen to no kanren ni tsuite, dai-2-ho, Showa 46-nendo bun chosa). Text in Japanese. 41p., Feb. 1973.*

Between February 1 and March 31, 1972, 347 bronchial asthmatic patients who live in two districts of Kawasaki city were given asthma diary forms to keep. These were daily logs for health state, asthmatic attack frequencies, symptoms during, before, and after the attacks, treatment, and other pertinent information. Only 67 patients, or 19% of the total patients returned the logs; they consisted of 36 males and 31 females; 19 cases were younger than 12 years of age and 16 cases were older than 30 years of age. These logs were compared with the daily records of sulfur dioxide concentration, suspended particulate concentration, temperature, and humidity during the same period. The asthmatic attack frequency lagged about a day behind high SO2 concentration, but there was a definite parallel and correlation. There was no correlation between asthmatic attacks and suspended particulates, temperature, or humidity.

31888 **APTIC NO. 53814**

Japan Environmental Agency, Air Quality Bureau

THE CONCENTRATION WHICH SHOULD BE PRESERVED FOR PROTECTION OF HUMAN HEALTH, WHICH THE SPECIALIST COMMITTEE OF THE ENVIRONMENT CONCERNING NITROGEN OXIDES HAS PROPOSED. *(Chisso sankabutsu-to ni kakawaru kankyo kijun senmon iinkai no teian shita hantei joken (hito no kenko o hogo suru uede iji sareru beki nodo joken) ni tsuite). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 22:59-61, July 1973.*

Nitrogen oxide and oxidant concentrations which affect human health are discussed. Nitrogen dioxide has mainly been studied. The experimental and epidemiological effects of NO2 on humans and animals are discussed. Floating dusts combine with NO2 to produce additive effects on the respiratory system. Sulfur dioxide also causes additive effects with NO2. Animal exposures to 0.5 ppm NO2 for 4 hr caused bronchiolitis, pulmonary emphysema, and effects on pulmonary cells. After a 12-month exposure to 0.5 ppm NO2, the mortality to artificial infections from pneumobacillus increased, and the ability to remove live bacillus decreased. After 6 mo of exposure to 0.5 ppm, the proliferation of bronchiole epithelial cells and slight pulmonary emphysema were observed. When NO2 was 0.062-0.109 ppm and nitrate in suspended particulates was more than 3.8 micrograms/cu m, the influenza morbidity and school absence rate increased without the presence of SO2. Chronic bronchitis morbidity correlated with NO2 concentrations. Photochemical oxidant influences resemble those caused by NOx, but are stronger. The effects of ozone include pulmonary edema, bronchitis, pulmonary emphysema, fibrosis, adenoma, and alteration of protein. Ozone exposure also increases sensitivity of bacterial infection. Exposure of humans for 1-2 hr to 0.5-1.0 ppm of O3 increases airway resistance, decreases lung diffusion, and decreases vital capacity. Oxidants also cause eye irritation.

31889 **APTIC NO. 53835**

Japan Environmental Agency, Tokyo, Air Quality Bureau

THE CONDITION OF CONCENTRATIONS WHICH SHOULD BE MAINTAINED FOR PROTECTING HUMAN HEALTH, PRESENTED BY THE COMMITTEE OF SPECIALISTS FOR ESTABLISHING THE ENVIRONMENTAL STANDARD OF SULFUR OXIDES, APRIL 26, 1973. *(Io sankabutsu ni kakawaru kankyo kijun senmon iinkai no teian shita hantei joken (Hito no kenko o hogo suru ue de iji sarerubeki nodo joken) no konkyo ni tsuite). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 22:57-58, July 1973.*

Toxic effects of sulfur dioxide on the respiratory system, decrease of resistance to microorganisms due to SO2, and synergistic effects of SO2 and floating particles and nitrogen oxides are discussed. School absences increase in areas with high SO2 concentrations. Mortality of respiratory disease patients increases when the SO2 6-day average is 0.12 ppm. Chronic bronchitis morbidity correlated with SO2 concentration in several cases. Sulfur dioxide also can increase the number of new patients with respiratory diseases and can lower pulmonary function in children. The committee utilized the epidemiological and experimental studies of SO2 toxicity to determine an air quality standard of SO2 based on concentrations which cause an increase of the morbidity (3%) of daily cough and sputum symptoms for more than 3 mo. The levels which cause the 3% or more morbidity are 0.032-0.035 ppm (yearly average) and 0.022-0.025 ppm (5-month average).

31890 **APTIC NO. 53693**

Berman, Ezra

THE HEMOGRAM OF THE CAT DURING PREGNANCY, LACTATION AND POST- LACTATION. *Preprint, National Air Pollution Control Administration, Vienna, Va., Hazleton Labs., 16p., 1973. 25 refs.*

During studies of the effects of strontium (90) in the in utero cat, it was observed that the mother cat s peripheral blood red cell values decreased 60% during pregnancy, and immediately after birth the values returned to normal. The variation in the hemogram could not be rationalized on the basis of isotopic insult alone. Therefore, hemograms of six cats were observed during pregnancy and for 14 weeks postpartum (lactation and postlactation). During the last trimester of pregnancy, a normocytic normochromic anemia occurred, which reverted to normal in the first days after delivery. The anemia was manifested by a decrease in erythrocyte numbers and hemoglobin. The reticulocytes responded to the anemia by appearing in greater numbers during the last trimester of pregnancy. The white blood cell numbers remained constant during the 23 weeks of observation. However, the concentration of segmented neutrophils was reduced to relatively lower values during the entire pregnancy. The plasma total protein remained stable, while plasma space increased due to a decreased cell volume. (Author abstract modified)

31891 **APTIC NO. 53767**

Chehreh, M. Nick, Roscoe C. Young, Jr., Herman Viaene, Carl W. Ross, and Roland B. Scott

SPIROMETRIC STANDARDS FOR HEALTHY INNER-CITY BLACK CHILDREN. *Am. J. Dis. Child, 126(2):159-163, Aug. 1973. 16 refs.*

Spirometric standards were established for healthy inner city black children aged 6-14 years. Tests conducted on 71 children in the sitting position, at the same time each day, were minute ventilation (VE), vital capacity (VC), 1 and 3 sec timed vital capacity (FEV1/FVC times 100 and FEV3/FVC times 100), and maximum voluntary ventilation (MVV). Multiple correlations of the independent variables of age and height for each of the parameters measured are as follows: for VC of boys, r equals .89, p is greater than .001; MVV, r equals .62, p is greater than .01; and for VE, r is below the level of significance. For VE of girls, r equals 152, p is greater than .05; VC, r equals .89, p is greater than .001; and for MVV, r is below the level of significance. These standards are intended to be used when testing black children. Comparisons were made with available data for children, and ethnic differences were attributed to both anthropologic and socio-economic factors. (Author abstract modified)

31892 **APTIC NO. 53898**

Chizhikov, V. A.

EFFECT OF NOXIOUS SUBSTANCES ON THE ANIMALS WITH WEAK HEALTH UNDER CONDITIONS OF CHRONIC POISONING. *(Vliyaniye vrednykh veshchestv na zhivotnykh s oslablennym zdorov em v usloviyakh khronicheskoy zatravki). Text in Russian. Gigiena i Sanit., no. 7:7-12, 1973. 3 refs.*

Albino rats with carbon tetrachloride-induced chronic hepatitis, radiation damage, and hormonal insufficiency were exposed to 0.01, 0.05, and 0.1 mg/cu m concentrations of phenol in chronic inhalatory tests for 73 days. Judged by the changes observed during the test duration in such parameters as motor chronaxia, cholinesterase activity, SH-group levels, and urine coproporphyrin excretion, increased susceptibility of the animals with impaired health to phenol was determined. While a phenol concentration of 0.01 mg/cu m was previously determined to be ineffective in healthy animals, the same concentration was found effective in the test animals. The findings suggest lowering the maximum allowable daily concentration of phenol in the air.

31893 **APTIC NO. 53817**

Conney, A. H., W. Levin, M. Jacobson, and R. Kuntzman

EFFECTS OF DRUGS AND ENVIRONMENTAL CHEMICALS ON STEROID METABOLISM. *Clin. Pharmacol. Therap., 14(4)part 2:727-741, 1973. 86 refs.*

The effects of drugs and environmental chemicals on steriod metabolism in humans and animals are reviewed. Compounds that stimulate the microsomal hydroxylation of drugs and steriods include phenobarbital, phenylbutazone, DDT and chlordane; inhibitors of microsomal hydroxylation include SKF 525-A, chlorthion, carbon tetrachloride, and carbon monoxide. Carbon monoxide markedly inhibits the metabolism of testosterone by rat liver microsomes. A ratio of CO/O2 of 0.5 inhibited the 7 alpha-, 6 beta-, and 16 alpha-hydroxylation reactions by 14%, 25%, and 36% respectively. The three hydroxylation reactions exhibited different sensitivities to CO. The ratio of CO/O2 needed for 50% inhibition of testosterone hydroxylation in the 16 alpha-, 6-beta-, and 7 alpha-positions was 0.93, 1.54 and 2.36 respectively. Treatment of rats or guinea pigs with phenobarbital induces the synthesis of liver microsomal enzymes that hydroxylate progesterone, estradiol, estrone, deoxycorticosterone, testosterone, delta 4-androstene-3,17-dione, and cortisol. Treatment of rats with SKF 525-A or CCl4 inhibits the activity of microsomal enzymes that hydroxylate steriods. Pretreatment of rats with phenobarbital decreases the uterotropic action of estradiol and estrone, the growth promoting effect of testosterone on the seminal vesicles, and the anesthetic action of progesterone and deoxycorticosterone. Pretreatment of rats with SKF 525-A or CCl4 enhances the uterotropic action of estrone. Phenobarbital, N-phenylbarbital, diphenylhydantoin, phenylbutazone, o, p prime-DDD and DDT are potent stimulators of microsomal hydroxylation in animals, and these compounds stimulate the urinary excretion of 6 beta-hydroxylcortisol in man. Treatment of humans with phenobarbital alters the proportion of testosterone metabolites excreted in the urine and decreases the action of prednisone in steroid dependent asthmatics. (Author abstract modified)

31894 **APTIC NO. 53852**

Cordasco, Edward M. and Fred D. Stone

PULMONARY EDEMA OF ENVIRONMENTAL ORIGIN. *Chest, 64(2):182-185, Aug. 1973. 27 refs.*

Pulmonary edema of environmental origin including data on 55 patients with chemical intoxication are discussed. The toxic agents included diborane, chlorine, phosgene, hydrogen sulfide, and antimony pentachloride. Chlorine gas concentrations in the range of 40-60 mg/cu m (40-21 ppm) over a 1/2-to 1-hour period are hazardous and cause severe pulmonary congestion and edema. Phosgene at doses higher than 2 ppm causes bronchial, bronchiolar, and alveolar inflammatory reactions as a result of direct irritative effect. The threshold limit of phosgene is 1 ppm for an 8-hour period. Hydrogen sulfied is a rapid and powerful poison with the toxic effects achieved as low as 50 ppm (0.005%). Respiratory and olfactory paralysis follow relatively high exposure to levels of 300 ppm and higher. Environmental pulmonary edema can also be caused by heroin intoxication, edema associated with cerebral trauma, and that due to posttraumatic pulmonary insufficiency. Treatment includes inhalational therapy utilizing 40-60% oxygen with intermittent positive pressure breathing, endotracheal intubation, or tracheostomy in the most severe problems. Digitalis and diuretics may be beneficial in a limited number of patients. Corticosteroids and hexamethylentetramine are effective in specific types of intoxicants. Morphine sulfate and other narcotic agents are to be avoided in those patients with respiratory depression due to H2S, hydrogen cyanide, ozone, carbon monoxide, and heroin intoxication. (Author abstract modified)

31895 **APTIC NO. 53747**

Dale, Knut

EARLY EFFECTS OF QUARTZ AND TITANIUM DIOXIDE DUST ON PULMONARY FUNCTION AND TISSUE. AN EXPERIMENTAL STUDY ON RABBITS. *Scand. J. Resp. Dis. (Copenhagen), 54(3):168-184, 1973. 33 refs.*

The early effects of quartz and titanium dioxide dust on pulmonary function and tissue were investigated with rabbits. In one group of rabbits the right lung was injected with a suspension containing 400 mg quartz and another group was injected with 400 mg TiO2 dust. Perfusion and ventilation were measured after 1 wk and after 3 mo using a radiospirometric technique. After 1 wk, the relative ventilation of the right lung was significantly reduced in both the dust treated groups compared with a control group. Atropine had no effect on the reduced ventilation in the TiO2 treated animals. The X-rays revealed slightly saturated densities corresponding to the dust injected right lungs. In both dust injected groups, there was an approximately similar relative weight increase of the right lung. Histologic examination disclosed pronounced alveolar dust cell reactions in both groups, some thickening of the alveolar walls, and an increase of reticulin fibers in the quartz injected animals. Three months following the injection, animals injected with corresponding doses of the two types of dust showed normal radiospirometric findings. The animals given TiO2 showed a normalizing of the progressive pathologic anatomic silicotic changes of the right lung. The decreased function of the lung shortly after the dust administration may be explained by the increased amount of phagocytes in the alveoli and in the smaller air passages. The phagocytic reaction is unspecific and independent of the chemical character of the dust particles. (Author abstract modified)

31896 **APTIC NO. 53771**

Dale, Knut

A METHOD FOR INDUCING UNILATERAL SILICOSIS IN RABBITS BY AN INJECTION TECHNIQUE WITH SOME OBSERVATIONS ON LUNG CLEARANCE AND QUANTITATIVE EVALUATION OF EXPERIMENTAL SILICOSIS. *Scand. J. Resp. Dis. (Copenhagen), 54(3):157-167, 1973. 16 refs.*

An injection technique for inducing unilateral silicosis in rabbits is discussed in which a known amount of quartz dust was deposited in the right lung while the left lung remained free from particles. A rubber catheter which was thickened by a steel sphere was introduced into and held tightly to the right main bronchus of the rabbits. A nylon catheter with a record fitting for a syringe was brought through the rubber catheter and injected the quartz dust, type P 9 into the bronchus. The amount of quartz varied: 50 mg or 100 mg suspended in saline to a vol of 2 ml or 200 mg or 400 mg suspended in saline to a vol of 8 ml. The percentage of retention of silica increased with higher doses. The wet weight of the quartz threated right lung was expressed in percent of the total (right plus left) lung weight. In animals with a silicotic right lung, the weight of a normal right control lung in the same animal was estimated by multiplying the weight of the silica free left lung by the mean proportional between the right and the left lungs in normal animals. According to the same principle, the collagen content of the normal right control lung was estimated. The wet weight of the lung was a more sensitive measure of the fibrogenetic effect of quartz than the total collagen content of the lung. The collagen in percent of the dry weight of the lung was no higher for silicotic than for normal lungs. On the countrary, due to dilution, there was a tendency to slightly lower values for the silicotic lungs. (Author abstract modified)

31897 **APTIC NO. 53649**

Fenters, James D., John C. Findlay, Curtis D. Port, Richard Ehrlich, and David L. Coffin

CHRONIC EXPOSURE TO NITROGEN DIOXIDE. *Arch. Environ. Health, 27(2):85-89, Aug. 1973. 11 refs.*

Squirrel monkeys continuously exposed to 1 ppm of nitrogen dioxide for 493 days were challenged five times with monkey-adapted influenza A/PR/8/34 virus. All monkeys exposed to NO2 produced serum neutralization antibody within 21 days after virus infection, whereas only one control monkey exposed to filtered air showed comparable response. The differences observed in hemagglutination-inhibition antibody titers, body temperatures, respiratory functions, body weights, and hematological values between the experimental and control monkeys were not significant. Histopathologic examination of lung tissues indicated slight emphysema and thickened bronchial and bronchiolar epithelium only in monkeys exposed to NO2 and challenged with the influenza virus. Transmission electron microscopic examination did not disclose any ultrastructural changes that could be attributed to the experimental exposures. (Author abstract)

31898 **APTIC NO. 53769**

Frappier-Davignon, L. and J. St-Pierre

A STUDY OF THE COMBINED EFFECT OF AIR POLLUTION, OCCUPATIONAL EXPOSURE, AND SMOKING HABITS RESULTING IN OBSTRUCTIVE LUNG DISEASES. 2. FOOD PRODUCT PLANT WITH NO OCCUPATIONAL EXPOSURE. *(Etude de l effet combine de la pollution atmospherique, de l exposition professionnelle et des habitudes de tabac dans les affections pulmonaires obstructives. 2.-Firme d alimentation: exposition professionnelle nulle). Text in French. Union Med. Canada, 107(7):1542-1546, July 1973. 9 refs.*

The effects of different types of pollution on the respiratory tract of man were investigated. In a first stage, 316 employees of an alimentary firm where occupational exposure was minimal answered a questionnaire and had their respiratory function evaluated with the McKesson Vitalor Spirometer. Chronic respiratory symptoms declared by those persons were probably the effect of exterior air pollution and tobacco smoke acting separately or together. In the absence of occupational exposure along with low exterior air pollution, the use of tobacco multiplies by a factor of three the frequency of respiratory symptoms. (Author summary modified)

31899 **APTIC NO. 53738**

Furuuchi, Ichiro, Shintaro Ushjima, and Sanae Shimada

RESULT OF QUESTIONNAIRE INVESTIGATION INTO PUPILS (FROM APRIL 1972 - JUNE 1972) IN OMORI, SHIMODATE, SASHIMA AND KASHIMA DISTRICTS IN IBARAGI PREFECTURE: THE EFFECT ON RESPIRATORY FUNCTION. *(Gakudo no anketo chosa seiseki (1972.4-6) Omori, Shimodate, Sashima, Kashima chiku.-- kido no kino to sono eikyo ni tsuite). Text in Japanese. Japan Medical Coll., 7p., March 1973.*

Pupils from nursery to high school in these areas were subjected to the investigation. The sulfur oxides concentrations in Omori were 0.01 to 0.13 ppm during the period of investigation. The SOx concentrations in the other areas were not available. The numbers of younger pupils with subjective symptoms were almost the same in the Omori and Shimodate areas, whereas those of older pupils increased in the Omori area but decreased in the Shimodate area. Nose-related symptoms were the most common in younger pupils who also had more allergy cases. The nose-related symptoms included sneezing, rhinotenosis, and nasal discharge. The total numbers of younger pupils with respiratory symptoms were more than 50%, the highest was in Omori and the lowest was in Shimodate.

31900 **APTIC NO. 53893**

Furuuchi, Ishiro, Shintaro Ushijima, and Sanae Shimata

AIR POLLUTION AND HUMAN BODY--HOW ARE THEY TAKEN ILL? (Taiki osen to jintai--doshite byoki no narunoka). Text in Japanese. Japan Medical Coll., 7p., June 1973.

The respiratory functions of the human body were described, centering on that of nose. The respiratory tract consists of nose, throat, trachea, bronchi, and lungs. Air is first inhaled into the nose where it is warmed, its humidity is increased, and the dust content is removed by the mucous membrane and hairs. Foreign matter and bacteria are treated by the tonsils in the throat. The air is then filtered by the trachea and bronchi. Symptoms such as sneezing, sniffing, and coughing serve as warnings on the intrusion of foreign matter in air. When several symptoms occur simultaneously for a long time, they must be taken as the results of illness. Injuries to the respiratory tract by air pollutants can cause other symptoms such as bronchitis and bronchial asthma.

31901 **APTIC NO. 53750**

Grosser, P.-J., Ch. Stark and H. Mehlhorn

VITAL CAPACITY AND BREATHING TESTS OF SCHOOLCHILDREN IN DIFFERENTLY AIR-POLLUTED AREAS. *(Vitalkapazitaet und Atemstosstest gesunder Schulkinder aus lufthygienisch unterschiedlich belasteten Gebieten). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 19(8):565-568, 1973. 37 refs.*

Schoolchildren from grade school to junior high school from differently air polluted areas were selected for two series of examinations including breathing tests. For the first series 263 children of the fourth and fifth grades were selected randomly. For the second series 1390 children from first and fifth grades and junior high school were selected. The children were examined in June (emission minimum) and in January (emission maximum). The children were all healthy. For the children from heavily air polluted areas the results were clearly less favorable than those of children from less polluted areas. The differences could be statistically confirmed.

31902 **APTIC NO. 53746**

Hasegawa, Yutaka

PHOTOCHEMICAL SMOG AND ITS EFFECT ON HUMAN BODY. *(Kokagaku sumoggu to sono jintai eikyo). Text in Japanese. Seikatsu to Kankyo (Life Environ.), 18(8):13-16, 1973.*

Photochemical products in air include ozone, formaldehyde, peroxybenzoyl nitrate, peroxyacetyl nitrate, and acrolein. Ozone can be sensed at a level above 0.02 ppm, and at concentrations higher than 0.3 ppm it irritates the nose and throat mucous membranes. Eye irritation was due to the oxidants other than ozone at concentrations higher than 0.1 ppm. The oxidants are also responsible for bronchial asthma and other respiratory diseases. There were 21,245 complaints with injuries from oxidants in 1972, a more than 50% decrease from 48,118 complaints in 1971. However, the total emergency warnings increased from 103 in 1971 to 176 in 1972. Tokyo was the most polluted area, with 38 warnings in 1971 and 23 warnings in 1972. It also had highest numbers of complaints with injuries, followed by the Saitama area. The average oxidant concentrations in Tokyo and Osaka city were comparable to those of Los Angeles.

31903 **APTIC NO. 53804**

Holusa R., F. Wobker, and H. J. Einbrodt

THE HISTOLOGICAL CHANGES OF THE LUNG AFTER SHORT-TERM INHALATION OF BARIUM SULFATE (ANIMAL EXPERIMENTS). *(Die histologischen Veraenderungen an der Lunge nach kurzzeitiger Inhalation von Bariumsulfat (Tierversuche)). Text in German. Beitr. Silikose- Forsch. (Pneumokoniose), 25(1):3-14, 1973. 7 refs.*

During a 2-month period, Wistar rats were exposed to 40 mg/cu m barium sulfate. For an additional 4 weeks, the post-inhalation phase, they were observed. At 14-day intervals the animals were sacrificed, and the lungs and lymph nodes were histologically investigated. An initial rapidly progressing cellular reaction of the lung parenchyma is followed by a proliferation of alveolar macrophages and a peculiar modification of bronchiolar epithelium. These epithelial changes regress slowly during the experiments without, however, causing lung damage. The assessment of possibly specific effects of barium sulfate dust can only be brought by comparison with other substances. The observed changes justify at any rate the classification of barium sulfate as an inert dust.

31904 **APTIC NO. 53730**

Jedrychowski, Wieslaw and Marek Ksiezyk

INDICES OF VENTILATORY LUNG FUNCTION (FVC, FEV 1, FEV%) WHICH ADJUST FOR AGE AND HEIGHT. *Brit. J. Prevent. Social Med. (London), 27(2):121-125, 1973. 2 refs.*

The practical value of Khosla indices were assessed on the basis of data obtained during epidemiological studies of chronic nonspecific chest diseases in two occupational groups, A (drivers) and B (workers in a chemical factory). Multiple regression equations of spirometric measurements on age and heights were derived. The correlation coefficients between deviation of the indices from the mean value and deviations of the observed values from regression lines taken for each person were calculated. The results of the correlation analysis gave evidence that there was a very high correlation (r equals 0.90) between the Khosla indices and real results of the spirometric tests. The chronic bronchitics had lower indices in both groups of workers, but in group B they were lower than in group A. The instructions for the use of the nomograms are 1) FEV or FVC: join the age and height axis and put a mark at the point of crossing with axis A; then put through the mark a new line to the observed value and read the index from the WFEC or WFEV axis; 2) FEV%: join the age and FEV% axis; at the point of the crossing of WFEV%, read the value of the index. (Author summary modified)

31905 **APTIC NO. 53813**

Kagamimori, S., T. Makino, Y. Hiramaru, S. Kawano, T. Kato, K. Nogawa, E. Kobayashi, M. Sakamoto, M. Fukushima, A. Ishizaki, K. Kanagawa, and S. Azami

STUDIES OF THE EFFECTS OF AIR POLLUTION CONSISTING OF DUSTS COMPOSED OF MANGANESE ON THE RESPIRATORY SYSTEM. PART II. THE CHANGE OF INFLUENCE ON HUMAN BODY DUE TO THE IMPROVEMENT OF THE ENVIRONMENT.

(Mangan o shuto suru hunjin ni yoru taiki osen no kokyuki ni oyobosu eikyo ni kansuru kenkyu -dai 2 ho- kankyo kaizen ni tomonau jintai eikyo no henka ni tsuite). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 20(8):413-421, 1973. 16 refs.

Students living near a ferromanganese factory and students in a control area were studied to determine the influence on the respiratory system of an improvement of the environment due to the installation of dust collectors at the factory. Pulmonary function remained the same before and after the dust collector installation. Contrary to results of the first study prior to dust collector installation, no significant difference was found between the polluted and control areas, except for the prevalence of wheezing and more eye irritation in third graders from the polluted area. Lower respiratory functions found in the first study were not found in the polluted schoolchildren of the second study, except for third grader boys who had lower forced expiratory volume and higher respiratory resistance. On students who received the first and second examinations respiratory symptoms decreased significantly on sputum and nasal catarrh, and forced expiratory volume improved on third graders. Thus, respiratory functions improved after manganese pollution had been reduced, although some effects remained on pupils who had more serious effects in the first study.

31906 **APTIC NO. 53776**

Kawabata, I., B. Satake, and H. Ishii

POLLENS AS THE CAUSE OF POLLENOSIS, SEEN BY A SCANNING ELECTRON MICROSCOPE, PART V, POLLEN OF HUMULUS JAPONICUS. *(Sosa denshi kenbikyo no sekai 163-kafunsho no genin to naru kafun, 5, Kanamugura no kafun). Text in Japanese. Igaku no Ayumi (Progr. Med.), 86(12):A-395 - A-396, Sept. 1973.*

Plants which produce pollens that cause pollenosis are discussed. Various plants blooming in autumn in Japan cause allergies. The pollens are scattered from the male flowers of the plant and are 22-26 micron in diameter. Photos of pollens taken by a scanning electron microscope are reproduced.

31907 **APTIC NO. 53744**

Machata, Gottfried and Reinhard Binder

THE DETERMINATION OF METALLIC TRACE ELEMENTS IN BIOLOGICAL MATERIAL BY FLAMELESS ATOMIC ABSORPTION. *(Bestimmung von Blei-, Thallium-, Zink- und Cadmiumspuren in biologischem Material mittels flammenloser Atomabsorption). Text in German. Z. Rechtsmed., 73(1):29-34, 1973. 21 refs.*

Atomic absorption spectrophotometry with a heatable graphite atomizer can be used to determine heavy metals such as lead and thallium in biological material. Because of matrix effects caused by the iron content of the blood, the calibration curves are rather flat and correspondingly imprecise. Such matrix effects can be avoided by adding lanthanium salts. For precise determinations of heavy metals, for example, normal content of lead in human blood, a preliminary dry ashing procedure with activated oxygen in a HF-induction furnace is suggested. Linear extinction versus concentration is given from 5-150 micrograms/100 g (0.05-1.5 ppm).

31908 **APTIC NO. 53593**

Marumo, Yoshiteru, Tomomasa Oikawa, and Tetsukichi Niwaguchi

DETERMINATION OF LEAD IN BIOLOGICAL MATERIALS BY ATOMIC ABSORPTION SPECTROPHOTOMETRY. *(Genshi kyuko bunsekiho ni yoru seitai shiryochu no namari no teiryo). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 22(8):1024-1028, Aug. 1973. 9 refs.*

The use of atomic absorption spectrophotometry for the determination of lead in biological materials is described. The lead was concentrated in the samples by pretreatment with ammonium pyrrolidine dithiocarbamate (APDC)-methyl isobutyl ketone (MIBK) extraction. The lead was extracted quantitatively at a pH range of 1.0 to 5.0. There was no interference with coexisting ions except a large quantity of iron, which can be removed by cupferron-MIBK extraction prior to APDC-MIBK extraction. The method is applicable to the determination of lead in biological materials, since recovery of lead from rat tissues is 98.0 to 102.3%, the coefficient of variation is 1.1 to 5.6%, and the bias is not significant. Samples were destructed with a mixture of nitric acid and perchloric acid, and the residue obtained was dissolved in 5 ml of hydrochloric acid (1:1). For samples containing more than 160 micrograms of iron, the sample solution was transferred into a 25 ml volumetric flask, and 1 ml of 10% cupferron solution and 1 ml of MIBK were added to the solution. The flask was shaken for 30 sec and the organic layer was discarded. The cupferron-MIBK extraction was repeated until the organic layer became colorless. The aqueous solution was transferred into extraction centrifuge bottles and 3.5 ml of 10% ammonium citrate solution and three drops of thymol blue were added to the solution. After the pH was adjusted to three with ammonia water, 0.5 ml of 4% APDC solution and 2 ml of MIBK were added. The bottle was shaken mechanically for 3 min and centrifuged. The organic layer separated and was applied to atomic absorption spectrophotometry for the determination of lead.

31909 **APTIC NO. 53689**

McDonald, Gary C. and Richard C. Schwing

INSTABILITIES OF REGRESSION ESTIMATES RELATING AIR POLLUTION TO MORTALITY. *Technometrics, 15(3):463-481, Aug. 1973. 30 refs.*

The instability of ordinary least squares estimates of linear regression coefficients is demonstrated for mortality rates regressed around various socio-economic, weather, and pollution variables. The ridge regression coefficients obtained at k equals .2 for 15 explanatory variables, with one notable exception, appear to be reasonable values upon which to base a quantification of the association between these variables and the total mortality rate. The exception is the nitrogen oxides pollution potential coefficient, which is very sensitive to both the logarithmic transformation and the deletion of two data points are previously indicated. This sensitivity highlights the need for model specification based on physical considerations as well as an appropriate expansion of the data base employed in these analyses. The Los Angeles and San Francisco data provide information on a rather unusual combination of factors and should motivate further investigations, rather than rejection of the two observations. In regards to the other two pollution potentials, the hydrocarbon term consistently exhibits no detrimental effect on mortality, while the positive association of the sulfur dioxide potential is substantial. The effects of precipitation, population density, the percent nonwhite, the percent under $3000, and relative humidity are all increasing, with the first three of these variables having relatively large effects. The other weather and socio-economic variables investigated possess negative coefficients and have a decreasing effect on the total mortality rate, with relatively large contributions coming from the January temperature and education terms. (Author summary modified)

31910 **APTIC NO. 53775**

Miyoshi, S. and S. Nishijima

ANALYSIS OF BERYLLIUM BY A LASER-MICROPROBE. *(Reza maikuro purobu ni yoru beririumu no bunseki). Text in Japanese. Igaku no Ayumi (Progr. Med.), 86(10):728, Sept. 1973. 7 refs.*

The number of infants with nasal hemorrhages around the Osaka airport has increased. Beryllium concentrations of 3-10 ppm have been detected in the soil around the airport. Beryllium causes hyperemia and conjestion in the respiratory system of rats and rabbits and may be the cause of the nasal hemorrhages. Soils and tiles in the area were analyzed by a laser microprobe and a spectral photometer. A few ppm of beryllium was detected and confirmed by atomic absorption spectrometry. The toxicity of beryllium exhausted by jet airplanes is mentioned.

31911 **APTIC NO. 53780**

Nagumo, Kiyoshi and Kazuo Amaya

RELATIONSHIP BETWEEN THE SYMPTOMS CAUSED BY TOKYO SMOG AND CYANO COMPOUNDS, PART I. ANALYSIS OF THE SYMPTOMS CAUSED BY THE SMOG AND THE SYMPTOMS CAUSED BY CYANO COMPOUNDS. *(Tokyo sumoggu ni okeru higai shojo to shian kagobutsu tono kankei -dai 1po- shojo no bunseki to shian kagobutsu no shojo). Text in Japanese. Koshu Eisei (Public Health), 37(9):631-636, Sept. 1973. 17 refs.*

Smog episodes at three schools were studied and cyano compounds as well as oxidants were found to cause the smog symptoms. Oxidant concentrations were 0.00-0.25 ppm, 0.05 ppm, and unavailable at the three schools. Symptoms included eye, nose, and throat irritation, numbness of extremities, abdominal pain, and general ill feeling. These symptoms are similar to those caused by cyano compounds such as hydrogen cyanide, cyanogen chloride, cyanamide, cyanates, and cyanic acid.

31912 **APTIC NO. 53827**

Nolte, D.

ACUTE BRONCHOCONSTRICTION AS REACTION TO ENVIRONMENTAL IRRITANTS. *(Die akute Bronchokonstriktion als Reaktion auf Umweltfaktoren). Text in German. Pneumonol. (Berlin), 148(3):187-195, 1973. 31 refs.*

Smoking and air pollution can trigger the deterioration of bronchial diseases. In a study of 36 normal persons, 31 patients with chronic bronchitis, and 24 patients with exogen-allergic asthma, the effect of inhalation of cold air (0 to -2 C for 10 min) was compared to the effect of tobacco smoke inhalation (filter tipped cigarette for 4 min). The increase of airway resistance measured by body plethysmography was largely dependent on individual factors and on preexisting bronchial diseases, and only to a lesser degree on the type of irritant. The mean increase in airway resistance after tobacco smoke, as after cold air, was about twofold in the bronchitis group and fivefold in the asthma group against the reaction of normal controls. Etiology and pathophysiology of the varying individual irritability of the bronchial tree are discussed. The acute reaction of the tracheo-bronchial system to tobacco smoke, cold air, and many other exogeneous pollutants including sulfur dioxide is based on reflex-triggered bronchoconstriction. The close correlation between the effect of cold air and tobacco smoke suggests that the extent of bronchomotoric irritability, regardless of the pollutant that is inhaled, is a certain biological property of the individual organism.

31913 **APTIC NO. 53729**

Plopper, C. G., D. L. Dungworth, and W. S. Tyler

PULMONARY LESIONS IN RATS EXPOSED TO OZONE. *Am. J. Pathol., 71(3):375-386, June 1973. 26 refs. (Presented at the Electron Microscopy Society of America, Annual Meeting, 30th, Los Angeles, Calif., Aug. 1972.)*

Selective embedding processes were used to identify lesions in different regions of pulmonary acini in a histologic and ultrastructural study of the effects of a 4-hour exposure to 3 ppm ozone on rat lungs. There was a gradation of epithelial damage in acini; the severest lesions were located centrally, where there was necrosis of bronchiolar epithelium and membranous pneumonocytes. In the peripheral acinar regions, membranous cells were normal; granular pneumonocytes were normal also. In contrast, lesions in capillary endothelium were more widespread. Endothelial swelling was seen in all portions of acini, but was more common centrally, and ring-like formations of endothelial membranes were found peripherally. Early stages of alveolar edema were more often seen in peripheral acinar regions and were usually accompanied by interstitial edema. These results conform that the brunt of ozone damage is borne by centriacinar regions. The apparent separation of centriacinar epithelial damage from the peripheral location of the earliest detectable edema indicates that further exploration is needed to determine to what extent different, although overlapping, sets of pathogenetic factors might be involved. Four separate groups of adult male rats were exposed to ozone in the study. (Author abstract)

31914 **APTIC NO. 53760**

Sebayashi, T.

INVESTIGATION ON THE SUBJECTIVE SYMPTOMS OF STUDENTS AT SCHOOL AS VICTIMS OF PHOTOCHEMICAL SMOG AND THE AIR POLLUTANTS. *(Kokagaku sumoggu ni yoru to omowareru higaiko deno jikaku shojo chosa to taiki osen busshitsu). Text in Japanese. Taiki Osen Nyusu (Air Pollution News), no. 77:2-4, July 1973.*

Questionnaires were distributed to about 140 students injured by photochemical smog while exercising at three junior high schools in the city. All three incidents occurred during or immediately before emergency warnings on photochemical smog were issued. The A school is located in more populated market area 800 m north to no. 2 highway and B and C schools are located in apartment complex areas without nearby factories. The B school which is only 50 m north of an expressway had the highest rate of injuries, 103 out of 180 students exercising in the school yard. More than 60% of the victims at B and C schools had respiratory symptoms, while 44% of those from A school had the same symptoms. Twenty-nine percent of the victims at A school had eye irritation, whereas at B and C schools only slightly over 10% had eye irritation. Records of sulfur oxide and oxidant concentrations at nearby monitoring stations showed abnormally high pollution before the incidents.

31915 **APTIC NO. 53853**

Sera, Yoshizumi, Kan-Young Kang, and Kunihiko Yokoyama

ASBESTOSIS AND LUNG CANCER IN OSAKA SENNAN DISTRICT. *Gaan (Japan J. Cancer Res.), 64(3):313-316, June 1973. 16 refs.*

Asbestosis and lung cancer among the workers in the asbestos factories in the Senna district of Osaka Prefecture are discussed. Ten cases of lung cancer were diagnosed since 1957 by autopsy or histological study of sputum smear. The subjects were male, ranged from 32 to 77 years, and were exposed to asbestos from 4 to 42 years. Eight were cigarette smokers. The histological study revealed three adenocarcinomas and seven squamous cell carcinomas. Asbestos bodies were found in lung tissue and occasionally in sputum. The first survey for the detection of asbestosis among workers in Sennan district was made in 1957 among 814 workers; 88 or 10.8% had asbestosis. By 1972, 30 of those persons were dead. Causes of death were lung cancer, gastric cancer, pulmonary tuberculosis, other pulmonary diseases, cardiovascular diseases, and other diseases. A similar survey was made on 444 workers in 1972 and one case of lung cancer and 53 cases of asbestosis were identified. Of patients who were hospitalized from 1953 to 1972, 10 of 38 patients with asbestosis also had lung cancer while 13 of 263 cases with silicosis and 5 of 53 cases with other pneumoconioses had lung cancer. These results show lung cancer to be associated more frequently with asbestosis than with silicosis and other pneumoconioses.

31916 **APTIC NO. 53650**

Shabad, L. M.

POSSIBILITIES FOR ESTABLISHING MAXIMALLY PERMISSIBLE DOSES AND MAXIMALLY PERMISSI-

BLE CONCENTRATIONS FOR CARCINOGENIC AGENTS. *(Moeglichkeiten, maximal zulaessige Dosen (MZD) und maximal zulaessige Konzentrationen (MZK) fuer karzinogene Stoffe festzulegen). Text in German. Arch. Geschwulstforch., 41(3):217-220, 1973. 14 refs.*

Possibilities of, and the need for, establishing maximally permissible doses and maximally permissible concentrations for carcinogenic agents are discused. The circulation of hydrocarbons in man s environment is explained with particular reference to 3,4-benzopyrene. The view is advanced that it would be wrong to speak summarily of maximally permissible doses or concentrations for carcinogenic agents as a whole, and that it is necessary instead to establish such values for each carcinogenic agent individually. Noncarcinogenic doses are valid for certain experimental arrangements only and for the animal species involved in the given experiment. A demonstration is given of the calculation of threshold values for man.

31917 APTIC NO. 53643

Sherwin, Russell P. and Deborah Alexander Carlson

PROTEIN CONTENT OF LUNG LAVAGE FLUID OF GUINEA PIGS EXPOSED TO 0.4 PPM NITROGEN DIOXIDE. *Arch. Environ. Health, 27(2):90-93, Aug. 1973. 16 refs.*

Lung lavage and disc-gel electrophoresis of the lavage fluid were carried out in a study of 18 guinea pigs, half of which were exposed continuously over a 1-week period to 0.4 ppm nitrogen dioxide. Eight of nine animal pairs were characterized by higher protein levels for the exposed animals (P less than 0.001). The values for eight of nine control animals were 0.1097 (arbitrary units) or less, whereas those for eight of nine exposed animals were 0.1164 or higher, with a maximum of 0.1698. The methodologies represent a relatively simple means of detecting a physiologically important alteration and have the potential of greater sensitivity to and specificity of protein content through new advances in electrophoretic techniques. (Author abstract)

31918 APTIC NO. 53684

Taskinen, Eero, Kaj Ahlman, and Matti Wiikeri

A CURRENT HYPOTHESIS OF THE LYMPHATIC TRANSPORT OF INSPIRED DUST TO THE PARIETAL PLEURA. *Chest, 64(2):193-196, Aug. 1973. 17 refs.*

A hypothesis of the lymphatic transport mechanism of inhaled dust particles to the parietal pleura was developed based upon a case report. The autopsy of a 77 year old molder who had been employed for 41 years in iron foundries showed heavy mixed dust pneumoconiosis. In the partietal pleura there were black linear streaks following the course of intercostal arteries. These formations were microscopically interpreted as periarterial lymphangitis and fibrosis caused by the dust. According to the hypothesis, the dust particles were transported from the lungs via the lymphatic vessels partly in retrogression. The mechanism is supposed to be the same in the transport of small asbestos particles causing pleural plaques. (Author abstract modified)

31919 APTIC NO. 53686

Vostal, J. J. and T. W. Clarkson

MERCURY AS AN ENVIRONMENTAL HAZARD. *J. Occup. Med., 15(8):649- 656, Aug. 1973. 61 refs. (Presented at the American Industrial Hygiene Conference, San Francisco, Calif., May 17, 1972.)*

The environmental hazards of mercury are reviewed. Mercury enters the human body through air, water, and certain fresh water and marine fish. It is completely absorbed across the gastrointestinal tract. A daily intake of 300 micrograms Hg as methyl mercury compounds may result in adverse effects on health after 1 yr of continuous exposure. A safety factor of 10 was proposed to allow for effects on the fetus and early stages of life and to take into account other extremes of sensitivity in the population. Thirty micrograms Hg/day is recommended as the upper limit of safe continuous intake. The precise degree of hazard to human health cannot be accurately estimated. Vital information is lacking on patterns of consumption of fish by the population, uncertainty exists in our knowledge of the dose response curve in man, particularly in the low dose aspect of this curve. There is little knowledge of the interaction of methyl mercury with other constituents in the diet, such as selenium. The short chained alkyl mercurials are the greatest potential hazard to man. They are completely absorbed from food, readily cross the blood brain and placental barriers, and are slowly excreted from the body. Damage inflected by these mercurials to the peripheral and central nervous systems is frequently irreversible. (Author summary modified)

31920 APTIC NO. 53778

Yamashita, T., M. Matsushima, H. Miyawaki, N. Kawamoto, F. Ono and T. Hayashi

RESULTS OF AN INVESTIGATION OF NASAL ALLERGY. *(Hana arerugi chosa ni tsuite). Text in Japanese. Hiroshima Igaku (J. Hiroshima Med. Assoc.), 26(8):999-1010, 1973.*

Nasal allergy having symptoms such as sneezing, disturbance of nasal respiration, and snivelling was studied in the spring and fall at two primary and two middle schools. Asthma was studied in Hiroshima and pupils in an area with bad odors from a refuse heap were thoroughly studied. Heredity, allergic symptoms, and other factors were studied by questionnaire. Children were studied by nasal examinations. No large difference in morbidity of nasal allergy was found between polluted and nonpolluted areas of Hiroshima. The rate of appearance of acidocyte in snivelling was larger with asthma patients and with patients having more serious symptoms. Children with allergies or nasal diseases were more easily affected by air pollution.

31921 APTIC NO. 53784

Zedda, S.

STEADY-STATE DIFFUSING CAPACITY FOR CO DURING EXERCISE IN NORMAL SUBJECTS. *Respiration, 30(2):127-131, 1973. 15 refs.*

The steady state diffusing capacity for CO (DLCO) during exercise was investigated in five healthy men. The subjects were tested at rest and during four exercise levels on a bicycle ergometer (60, 100, 140, 180 W). One subject was tested 30 times at different work levels from 10 to 180 W. The results suggest that DLCO increases at work as a curvilnear function of VO2 and VE. The scattering of the points is so large that the practical implication of steady state DLCO exercise during exercise is very uncertain. (Author abstract modified)

1972

31922 APTIC NO. 53758

Hashimoto, Hiroshi

THE EFECT OF ENVIRONMENTAL POLLUTION ON THE HUMAN BODY-THE HEALTH MANAGEMENT FOR RESIDENTS. *(Kankyo osen no jintai eikyo-jumin no kenko kanri o chushin to shite). Text in Japanese. Osakashi Kinmu Ishi Kenkyo Nenpo (Annu. Rep. Pract. Physicians Osaka), no. 1:7-18, 1972.*

Questionnaires on subjective symptoms were distributed to 1000 residents living in Main street areas and to 800 residents in control areas at least 50 m apart from the main street or intersection in Osaka city. Results showed that there were noticeable differences on 50 questions out of 60 questions on symptoms such as eye irritation, breathing difficulties, and uncomfortable stomach. Physical examinations were conducted on 407 residents from the polluted area and 342 residents from the control area. It was found that 4.8% of the former residents had white blood corpuscles below normal value and control residents had 2.8%. There was no noticeable difference between the two groups on the number of residents with abnormal hemoglobin value. However, if only nonsmokers were compared, 8.9% of the exposed group showed abnormal hemoglobin value while none of the control group was abnormal. The exposed group also showed slightly higher lead content in blood, but there was no noticeable difference of lead content in urine between the two groups.

31923 **APTIC NO. 53949**

Merchant, James A., Kay H. Kilburn, Willian M. O Fallon, John D. Hamilton, and John C. Lumsden

BYSSINOSIS AND CHRONIC BRONCHITIS AMONG COTTON TEXTILE WORKERS. *Ann. Internal Med., 76(3):423-433, March 1972. 22 refs.*

A survey of a modern cotton-synthetic blend mill was conducted to determine the prevalence and distribution by byssinosis, the effects of smoking, aging, and cotton-dust exposure on the frenquency ans severity of byssinosis, chronic bronchitis, and dyspnea (defined by index ratings), and whether total-dust samples would indicate byssinosis risk. Twenty percent of those working in preparation areas, 2% of those in yarn processing areas, and 6% of all employees were diagnosed as byssinotic. Among men, the byssinosis index increased with smoking and the bronchitis index increased with smoking plus dust exposure. Byssinotic workers were found to have more chronic bronchtis and dyspnea than matched control workers. Byssinosis and chronic bronchitis are both influenced by control-dust exposure and cigarette smoking. Total-dust samples in the plant gave no indication of byssinosis risk. (Author abstract)

31924 **APTIC NO. 53685**

Suzuki, Hisao

AIR POLLUTION IN THE IBARASHIMA DISTRICT OF AKITA CITY AND HEALTH HAZARDS. *(Akitashi Ibarashima chiku no taiki osen to kenko shogai). Text in Japanese. Akita-ken Ishikai Zasshi (Akita Med. J.), 24(2):57-66, 1972. 8 refs.*

The condition of air pollution in the Ibarashima industrial district in Akita city was investigated. In 1970, samplings taken by handy air samplers showed a sulfur dioxide concentration of more than 0.1 ppm at nine locations. After that, continuous monitoring automatic recorders were installed in the Ibarashima district and some other areas. A questionnaire concerning subjective health conditions was sent to 4355 people of several polluted districts, and 87.5% answers were obtained. The questionnaire was also sent to 2625 residents of a control area, and a 87.5% response was obtained. In the Ibarashima district, the SO2 concentration between Oct. 1970 and Dec. 1971 fluctuated between 0.024 and 0.056 ppm, exceeding the environmental standard of 0.05 ppm every month between February and May 1971. Health examinations showed that in the areas where air pollution was high, some form of health damage occurred. High rates of congestive bronchitis, chronic bronchitis, asthmatic bronchitis, emphysema, and acute bronchitis were found in the Ibarashima District. The ratio of patients to the total population in the control area was much lower in general, except for bronchial asthma, which was inordinarily high at 0.23%. There was significantly higher ratio of rhinitis, pharyngitis, and tonsilitis patients in the Ibarashima district compared to other polluted and control districts. Relatively high rates of eye disease were found in the control area; but bloodshot eyes and congectivitis were prevalent in polluted areas.

31925 **APTIC NO. 53896**

Yokoyama, Tetsuro

PULMONARY LESION BY OXIDANTS. *(Okishidanto ni yoru hai shogai). Text in Japanese. Clinician, no. 211:52-55, Sept. 1972.*

The lungs of patients chronically damaged by air pollution are in constant danger of reaching an unstoppable point such as emphysema, pneumoconiosis, and bronchodilation. Chronic respiratory damages occur mainly in the upper airways, but acute respiratory damages by oxidants appear in the peripheral structure of the lung, such as bronchiole, alveoli, and the lung surfactants. Damage to ventilation causes acute respiratory alkolosis and leads to secondary symptoms such as headaches, nausea, stiffness of the limbs, numbness, and other general reactions of the body. The mechanism of oxidant damage on the body is not clear, but the relationship between Vitamin E and the lung damage by oxidants has been proven by experiments. Vitamin E seems to increase the body resistance against oxidants; rats injected with vitamin E show a higher rate of survival against oxidant exposure compared to those without vitamin administration. Also, rats with Vitamine E deficiency have high mortality when exposed to oxidants. In test tubes the level of blood chemical change caused by ozone shows a relationship with the vitamin E level.

1971

31926 **APTIC NO. 53931**

Bouhuys, Arend

MAXIMUM EXPIRATORY FLOW-VOLUME CURVES IN CHILDREN AND ADOLESCENTS. *Bull. Physio-Pathol. Respir. (Nancy), no. 7, p. 113-123, 1971. 12 refs.*

Recent studies of pulmonary function in children and adolescents are reviewed. Over the age range of 6 to 18 years, maximum expiratory flow rates on MERV curves, as well as airway conductance, increase in proportion to total lung capacity. This suggests that the lungs and airways, as a whole, grow isotropically. The simple relationships between a measure of lung size (TLC) and maximum expiratory flow rates may be useful for the assessment of changes of pulmonary function in children during the period of their growth. In studies of children with bronchial asthma or cystic fibrosis, flow rates on MERV curves, measured at relatively small lung volumes, proved to be sensitive indices of the degree of functional impairment. These flow rates were often abnormally low when conventional indices (PEFR, FEV 10) were within normal limits. The MERV curves provide a sensitive method of assessing the degree of small airway obstruction in persons with lung disease, even when the lesions are subclinical. (Author abstract)

31927 **APTIC NO. 53954**

Chiang, S. T., B. C. Wang, Y. L. Chi, and Y. C. Hsieh

VENTILATORY COMPONENTS OF LUNGS IN RELATION TO SEX AND AGE. *Am. Rev. Respirat. Disease, vol. 104:175-181, 1971. 23 refs.*

Ventilatory components of lungs were studied for multiple breath nitrogen washout in a group of 225 subjects, 123 males and 102 females, ranging in age from 7 to 30 years. Open-circuit, end- tidal nitrogen concentrations were recorded by a rapidly responding nitrogen meter. Lungs with two exponential components were found in 21.3% of the subjects. The percentage of two component lungs increased with age because of an unequal change in alveolar volume and airway conductance, due to different growth rates in lung areas that might have resulted in the diversity of time constants. As the lung grows, the pleural pressure gradient between apex and base becomes greater, and the static pressure volume curve of the lungs might no longer be a single component. In different age groups between 10 and 30 years the occurrence of single and double component lungs in males and females did not differ significantly. (Author abstract)

31928 **APTIC NO. 53731**

Toyama, Toshio, Takeo Suzuki, Hiroshi Maeda, and Hiroyuki Sakabe

A METHOD FOR EVALUATION OF THE EFFECT OF GAS-PARTICULATE MIXTURE LOAD IN THE AIR ON RESPIRATORY ORGANS AND A STUDY ON ITS PRACTICAL APPLICATION. *(Kukichu no gasu to fuyu ryushibutsu no kongo ni yoru kokyuki ni taisuru fuka no hyokaho to sono jissai oyo no kenkyu). Text in Japanese. Kenkyu Hokoku Shuroku Igaku Oyobi Yakugaku-hen (Rep. Res. Grantees, Min. Educ. Med.), no. 2:227-229, 1971. 11 refs.*

Studies were made on the effects of urban air pollution loads on the function of human respiratory apparatus in order to determine epidemiologically permissible standard levels for these pollutants. The blood carboxyhemoglobin and its correlation with carbon monoxide in the air, the effects of traceable CO gas, and the effects of sulfur dioxide and ozone on guinea pigs lung ventilation function were studied by surface tension. Peak flow levels and lung capacity were studied in relation with other conditions of the human body and environmental hazardous material were determined. Anti-eggwhite lysozyme and mother s milk lysozyme were separated and refined, and deactivation of lysozyme by pollutants were studied. Ozone exposure decreased lung compliance and eventually apneumatosis. The increase of lung histamine was remarkably manifest when ozone concentration was increased to 6.1 ppm. The chemical structure of human lysozymes and the bondage order of 129 amino acids were determined. Deactivation of lysozyme by ozone was confirmed. The correlation of the human weight or sitting height with peakflow was determined for men and women.

1949

31929 **APTIC NO. 53703**

McCord, Carey P. and William N. Witheridge

THE INFLUENCE OF ODORS ON HEALTH AND COMFORT. *In: Odors - Physiology and Control. New York, McGraw-Hill, 1949, Chapt. 7, p. 59-72. 3 refs.*

Sanitation and medicine are still mildly handicapped by the traditional belief that odors breed disease and impair health. Generations ago, physicians themselves created this error; and while physicians long since have disassociated their activities based on the concept of odors as causes of disease, it is far more difficult to remove this fallacy from the minds of a large portion of the public. The genuine part played by odors in relation to health is minor and dips deeply into emotions and neuroses. At the extremes offensive odors unfavorably influence health only through the possibilities of lessening food and water intake, disturbing sleep, promoting nausea and vomiting, and provoking anger with its attending evils.

EFFECTS-PLANTS AND LIVESTOCK

1973

31930 **APTIC NO. 53903**

Japan Society of Air Pollution, Research Committee

PHOTOGRAPHS OF PLANTS DAMAGED BY AIR POLLUTION. *(Taiki osen shokubutsu higai shashin-shu). Text in Japanese. 229p., March 1973. 17 refs.*

Plant damage by air pollutants are displayed in hundreds of photographs. Pollutants such as sulfur dioxide, nitrogen dioxide, and ozone cause necrosis between veins of leaves, hydrogen fluoride causes necrosis at the edges of leaves. Oxidants such as aldehydes and peroxyacetyl nitrate (PAN) cause the formation of silver-grey color on the backs of leaves. At lower pollutant concentrations, chlorosis of leaves or invisible injuries such as plant growth retardation occurs. Plants weak in resistance to SO2 are alfalfa, barley, cotton, marvel-of-Peru, rhubarb, cosmos, and sweet pea; those strong in resistance are musk melon, citrus fruits, celery, and chrysanthemum. The resistance to SO2 increases as the humidity decreases. The threshold value of HF was several ppb using gladiolus as the indicator plant. The resistances of plants to air pollutants depend not only on the plant and pollutant, but also on meteorological conditions and planting conditions.

31931 **APTIC NO. 53688**

Abe, Manabu

URBANIZATION AND WILDLIFE. *(Toshika to yasei choju). Text in Japanese. Shinrin Ricchi (Forest Environ.), 14(2):19-23, Feb. 1973. 24 refs.*

A strange phenomenon has been noted in Tokyo recently: the number of birds has increased in heavily polluted metropolitan Tokyo compared to several years back. The distribution of these birds forms a doughnut shape, avoiding the treeless central Tokyo and suburban residential areas. The deterioration of greenery in the suburbs has forced the birds back to the city where there are some signs of vegetation. The reasons for the disappearance of greenery from the suburbs are the increasing number of buildings on the ground, the change of soil temperature, atmospheric temperature humidity, and decrease of ground water all due to the changes on the ground surface, plus air pollution by traffic. In the precinct of the Meiji Shrine in Tokyo, where the original natural forests are still preserved, 3000 red and black pines have died in the 25 years after the war; the constituents of the forests are gradually changing to sturdier evergreen camphor trees. In the Meguro district, 5% cedars, 10% red pines, 20% chestnuts, 35% black pines, and 90% pasania trees have died in the past 20 years. The pine trees in Miyajima, the island once famous for its beauty with pine trees and maple trees, were damaged by the combination of sulfur dioxide gas from the petroleum industries of the opposite shore and insects. It is said that approximately 20,000 trees have died in recent years. A recent investigation in Tokyo revealed that the pigeons in Tokyo are chronically poisoned by lead from automotive exhaust gas. As much as 70 micrograms/100 cc of lead have been found in the blood of a pigeon.

31932 **APTIC NO. 53809**

Beitz, Lieselotte

ANALYSIS OF POLLUTANTS IN PLANS WITH X-RAY FLUORESCENCE. *(Analyses von Schadstoffen in Pflanzen mit dem Roentgenfluoreszenzverfahren). Text in German. Chemiker-Ztg. (Heidelberg), 97(8):424-426, Aug. 1973. 6 refs.*

The X-ray fluorescent analysis of plants can be used to determine traces of toxic elements. The accuracy and limits of detection of these traces in dried plants are discussed. The analysis can be completely automated. Lead has been determined in plants near highways using this technique. The accuracy of the method is determined by the slope of the calibration curve and the measurement time. For the pollutants manganese, copper, zinc, lead, selenium, and arsenic which were in most cases present in concentrations between 1 and 10 ppm, near highways, the accuracy was between 1 and 10% relative. Systematic lead determinations in plant material (grass, leaves, and corn) showed a clear dependence of the lead concentration on the distance from streets and parking lots, on traffic density, and on the wind direction. In the grass taken from the dividing strip of the Autobahn Freiburg-Karlsruhe, the average Pb concentration was 200 to 400 ppm. On parking areas near the Autobahn, it drops to about 20 to 50 ppm. In a meadow for cattle grazing 300 m away from the Autobahn, a Pb concentration of about 5 ppm was measured in the grass. Twice as much lead is accumulated in leaves as in grass.

31933 **APTIC NO. 53641**

Hill, Clyde A., Thomas W. Barrett, Steven Hill, and Connie Lamb

SENSITIVITY OF NATIVE DESERT VEGETATION TO SO2 AND SO2 PLUS NO2. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 21p., 1973. 11 refs. (Presented at Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-109.)*

Interest in possible air pollution-related injury to native species was generated with the construction of several large-coal fired power plants in the southwest desert areas of Utah, New Mexico, Arizona, Colorado, and Nevada. The effects of sulfur dioxide and sulfur dioxide plus nitrogen dioxide, the two major phototoxic pollutants emitted from coal-fired power plants, on native vegetation were studied via fumigation experiments in which portable chambers were placed over 87 plant species in the field. Pollutant concentrations were measured and controlled with instruments located in a mobile laboratory. Each of the 186 fumigations lasted for 2 hr, with the pollutant concentrations ranging from 0.5 to 11 ppm SO2 and 0.1 to 5 ppm NO2. The SO2 concentrations above 2 ppm caused injury to all but a few of the species studied, and many of the plants proved to be highly resistant to injury from the pollutants. No evidence of synergism between SO2 and NO2 was detected. When SO2 injury occurred, it appeared within a few days of fumigation. The most common sign of injury was leaf necrosis, with middle-aged and older leaves being more susceptible to injury than younger, expanding leaves. (Author abstract modified)

31934 **APTIC NO. 53951**

Knabe, W.

AIR POLLUTION AND FOREST PLANTS. 8TH INTERNATIONAL CONFERENCE OF FOREST SMOKE DAMAGE EXPERTS, HELD IN HUNGARY, 1972. *(Luftverunreinigung und Forstpfalanzen. VIII. Internationale Arbeitstagung forstlicher Rauchsachdensachverstaendiger 1972 in Ungarn). Text in German. Allgem. Forstztg., no.10:196, 198, 200, 1973. 7 refs.*

The nature, diagnosis, physiological aspects, and prevention of smoke-induced forest damages were discussed on the 8th International Conference of Forest Smoke Damage Experts held in Hungary, 1972. The diagnosis of forest damages is possible from both visible and hidden alterations of the trees, i.e., the increased acidity of the bark as an indicator of sulfur dioxide induced damages, or above-normal lead, chlorine, calcium, and magnesium contents in bark as indicators of corresponding emissions. Chronic forest damage due to automobile exhaust gases was evidenced. High susceptibility of conifera to ammonia, and relatively high resistance against this substance of Quercus rubra, Wuercus robur, Robinia pseudoacacia, and Acer campestre were noted. Intense damage of deciduous woods around aluminum works was observed. The use of resistant species in potential damage areas, nitrogen fertilization, and the application of chlorocholin chloride were cited among the possible measures to be taken to abate smoke damages. The uptake and transport of toxic substances by plants, the effects of toxic substances on plant materials, the combined effect of frost and smoke and draught and smoke, and the resistance-increasing effect of fertilization, and therapeutic measures should be thoroughly investigated in future physiological studies on forest smoke damages.

31935 **APTIC NO. 53779**

Kobayashi, Yoshio

INDEX PLANTS FOR AIR POLLUTION. *(Taiki osen no shihyo shokubutsu). Text in Japanese. Shinrin Ricchi (Forest Environ.), 14(2):13- 18, Feb. 1973.*

Air pollution in cities has caused damage to trees and a decline in the number of trees in the cities. It has caused defoliation of the zelkova trees. Plant damage can be used as an indicator of pollution. Damage symptoms vary according to pollutant and season. Sulfur dioxide (0.8 ppm) caused visible damage on half the potted plants during a laboratory experiment. Ozone also caused damage to plants during experiments.

31936 **APTIC NO. 53759**

Matsunaka, Shoichi

THE EFFECT OF PHOTOCHEMICAL AIR POLLUTANTS ON PLANTS. *(Kokagakuteki taiki osen busshitsu no shokubutsu e no eikyo). Text in Japanese. Seikatsu to Kankyo (Life Environ.), 18(8):17-21, 1973.*

The injuries that ozone causes on plants include the formation of white or brown spots on leaves, the bleaching or browning of leaves, necrosis, and leaf falling. The injuries caused by peroxyacetyl nitrate were the same as those caused by ozone except that the damage was greater on premature leaves. The plants that are weak in resistance to ozone are tomato, pinto bean, tobacco, spinach, potato, alfalfa, peanut, and grape; and those strong in resistance to it are gladiolus and red pepper. The plants that are weak in resistance to PAN are pinto bean, red beet, chickweed, dahlia, lettuce, and tomato; and those strong in resistance to it are begonia, chrysanthemum, corn, cotton, cucumber and balsam. The resistance depends largely on the plant and the pollutant. Therefore, the plant indicator method probably is the best way to monitor the effect of a given pollutant on certain plants. Morning glories were planted in the gardens of 200 homes in Osaka city to study the resistance to certain pollutants and similar studies were also conducted at grade and high schools in other cities.

31937 **APTIC NO. 53871**

Musche, R. and W. Lucas

HEAVY METAL CONTAMINATION OF FOOD PRODUCTS. *(Schwermetallkontamination von Lebensmitteln). Text in German. Deut. Lebensm. Rundsch., 69(8):277-278, 1973. 1 ref.*

Food products are being contaminated by physiologically harmful heavy metals through emission of industrial waste gases. This concentration is sometimes enriched by the treatment processes which the food products undergo. The total lead pollution of imported cocoa beans was determined. For this purpose cocoa beans from Ghana, Kamerun, Nigeria, Ivory Coast, Venezuela, Arriba, and Trinidad were crushed and ashed at 400 C. For the lead analysis the dithizone method by Oelschlaeger and Schwarz was used. The mean arithmetic lead concentration for cocoa beans from Ghana was 0.14 ppm, from Kamerun 0.27 ppm, from Nigeria 0.35, from the Ivory Coast 0.14, from Bahia 0.19, from Venezuela 0.25, from Arriba 0.20, and from Trinidad 0.22 ppm. The lead concentration did not differ much from that found in other raw products of the food industry.

31938 **APTIC NO. 53722**

Nouchi, Isamu, Toshio Odaira, Tadashi Sawada, Kuniko Oguchi, and Tetuhito Komeiji

PLANT OZONE INJURY SYMPTOMS. *(Ozon ni yoru shokubutsu higai shojo) Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 8(2):113-119, Aug. 2, 1973. 12 refs.*

A study of the phytotoxicity of ozone to plants was conducted in controlled atmosphere greenhouses to determine if the symptoms of such exposure would be similar to symptoms exhibited by plants exposed to photochemical smog (which contains ozone) in the Tokyo area. Test plants included herbaceous and woody plants, which were fumigated to 20 pphm ozone. Plants used as controls for the ozone exposure experiments were placed in a carbon filtered greenhouse. Herbaceous plants were generally sensitive to injury, especially Brassica rapa and Brassica pekinensis. Woody plants were rather resistant except for the poplar. Depending on plant species and the severity of injury, ozone-injury symptoms of the herbaceous plants included bleaching, chlorosis, necrosis, and reddish-brown flecks. Leaves of woody plants developed discrete, punctate spots, reddish-brown pigment on the upper surfaces, and defoliation. Ozone injury was typically confined to the upper leaf surfaces and notably maturer leaves. Microscopic examination showed that pallisade cells were more prone to ozone injury than other tissues.

31939 **APTIC NO. 53772**

Seki, T., S. Abe, H. Hoshikawa, Y. Inoue, N. Mawariya, and M. Kondo

INFLUENCE OF AIR POLLUTION ON PLANTS, PART I. THE CONTENT OF HEAVY METALS IN THE LEAVES OF ROADSIDE TREES IN SENDAI CITY. *(Taiki osen no shokubutsu ni taisuru eikyo(dai 1 po) Sendai shinai ni okeru gairojuyo no jukinzoku ganryo ni tsuite). Text in Japanese. Koshu Eisei (Public Health), 37(9):643-647, Sept. 1973. 2 refs.*

The amounts of lead, copper, cadmium, manganese, zinc, and iron in and on the leaves of trees near roads were determined in Sendai city. Leaves were sampled in late May, the middle of August, and in late October in center city with heavy traffic and in suburban areas with little traffic. Atomic absorption spectrophotometry was used to determine the metal content of the leaves. Lead and iron increased in Aug. and Oct. from May in all trees, cadmium had the same tendency in all but one type of tree, manganese had the same tendency in all but two tree species, and copper and zinc showed little seasonal fluctuation. Lead concentrations were twice as high in the central area as the suburban area, Mn was little more, Fe was about the same in zelkova trees and was twice as high in ginkgo, and Cu, Cd, and Zn had no difference. The amount of metals varied according to the type of leaf surface. The total amount of metals was higher in the central area than in the suburb (15 times higher for Pb, four for Cd, four for Mn, three for Zn, and six for Fe). The amount of Pb in ginkgo leaves and soil correlated.

1972

31940 **APTIC NO. 53935**

Grill, Dieter

OPTIC CHANGES IN HOMOGENATES OF SO2 - DAMAGES SPRUCE NEEDLES. *(Optische Veraenderungen in Homogenisaten SO2 - geschaedigter Fichtennadeln). Text in German. Int. J. Environ. Anal. Chem., 1(4):293-300, May 1972. 10 refs.*

Filtrates of spruce needles (Picea abies) were analyzed spectrophotometrically. The filtrates showed ultraviolet absorption maxima in the wavelength range of 2630277 nm, which was caused by phenolic compounds present in the spruce needles. Special attention was paid to p-oxyacetophenone, both as a aglycon (lambda max, 275 nm) and as the glycoside Picein (lambda max, 263 nm). The position of the ultraviolet absorption maximum depended on both seasonal and external influences, especially sulfur dioxide, on the spruce needles. Comparison of the maxima of ultraviolet absorption for exposed and non-exposed needles during the summer revealed significant differences which can be used as an additional aid to diagnose gas damages by air pollutants.

31941 **APTIC NO. 53948**

Kahn, Herbert L., Frank J. Fernandez, and Sabina Slavin

THE DETERMINATION OF LEAD AND CADMIUM IN SOILS AND LEAVES BY ATOMIC ABSORPTION SPECTROSCOPY. *At. Absorption Newslett., 11(2):42-45, March-April 1972. 4 refs. (Presented at the Meeting on Agronomy and Environmental Quality, New York, Aug. 1971.)*

Lead and cadmium were determined in soil samples taken from various locations near highways and gas stations, after both acid and acetate extractions, and in leaves after digestion in nitric acid. For soils, acid extraction gave consistently higher results than did acetate. The lead levels in all soils and leaves were sufficiently high that a standard instrument with a conventional burner could be used. The cadmium levels were marginal, and it proved desirable to improve sensitivity by employing a Delves micro-sampling system in conjunction with the burner. Lead in leaves can be determined directly, without prior dissolution, with the Delves system. The distribution of lead in leaves was not homogeneous. (Author abstract)

EFFECTS-MATERIALS

1973

31942 **APTIC NO. 53816**

Luffkin, A.

INFLUENCE OF SO3(-2)IONS ON PITTING CORROSION OF STAINLESS STEELS. *Anti-Corros., 20(7):3-8, July 1973. 19 refs.*

The influence of sulfite ions on pitting corrosion of stainless steels was electrochemically investigated. Sulfur dioxide and sulfites intervene in the pitting corrosion of stainless steels by acting as cathodic depolarizing agents, at least in the first phase of the attack. Initially there is a partial oxidation with the formation of sulfuric acid. The local drop in the pH value which results helps to promote the reduction of the remaining SO2. This reduction leads to complex and unstable mixtures, themselves sometimes very aggressive. The reactions are reversible. This hypothesis does not contradict Defranoux; there is nothing to prevent the two mechanisms occurring simultaneously during the course of the corrosive attack. An analogy can be drawn between them on the reduction of the SO2, since all the reactions have increasing potentials as their pH decreases. (Author summary modified)

31943 **APTIC NO. 53774**

Zolotarevskaya, L. K. and L. G. Angert

ATMOSPHERIC RESISTANCE OF LIGHT RUBBERS. *(Ob atmosferostoykosti svetlykh rezin). Text in Russian. Kauchuh i Rezina, no. 5:34- 37, 1973. 5 refs.*

The atmospheric resistance of light-colored rubbers was tested in weathering tests under normal and static load conditions. The reduced atmospheric resistance of light-colored rubbers, as compared to that of carbon black-reinforced products, was due to the nature of the fillers used rather than to the color of the rubber products. Increase in the resistance of light rubber to ozone cracking with increasing activity of the filler used was noted under static load conditions. The use of high-activity fillers lead to the formation of ozone-protecting films on the surface of light rubbers containing wax-like products. Light-colored resins without carbon black were inferior to carbon black-reinforced products regarding thermal oxidation and light aging. However, ozone cracks developed largely at the same time in light rubbers and chalk-filled, carbon-black reinforced rubbers.

1972

31944 **APTIC NO. 53950**

Fischer, Hans W. and Armin Zoellner

CONTRIBUTION TO THE USE OF CORROSION-PROOF JOINTS FOR OPEN AIR INSTALLATIONS IN THE CHEMICAL INDUSTRY. *(Beitrag zum Einsatz korrosionsgeschuetzter Verbindungselemente fuer die Freilufbauweise von Chemieanlagen). Text in German. Chem. Tech. (Berlin), 24(4):227-232, April 1972. 19 refs.*

Problems and possibilities for the protection of joints, including screws and bolts, at open-air chemical installations and apparatuses against atmospheric corrosion are described. The life of joints should equal that of the parts and assemblies they connect, which makes additonal treatment of such joints necessary. The use of joints made of stainless, acid-proof steel, or of corrosion-proof joints represents an economic option. Galvanized screws and bolts should be used for equipment which is not intended to be disassembled during its useful life. Hot galvanized or diffusion-galvanized screws and bolts should be used for joints that are to be detached relatively often. Galvanically cadmium-plated screws and bolts should not be used as joints in chemical equipment. Diffusion-chromed screws and bolts can be used for assemblies that will have to be disassembled later. Nickel-plated screws and bolts are necessary only if the joints are in direct contact with alkaline media. Galvanized, pot and diffusion-galvanized screws and bolts require additonal protection through paint coating or plastic caps.

EFFECTS-ECONOMIC

1973

31945 **APTIC NO. 53743**

Ayres, Robert U.

ECONOMIC IMPACT OF MASS PRODUCTION OF ALTERNATIVE LOW EMISSIONS AUTOMOTIVE POWER SYSTEMS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 32p., 1973. (Presented at Air Pollution Control Association, Annual, Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-11.)*

A range of possible effects on the transportation industry, satellite, industries, labor market, and economy which might be anticipated to result from the mass production of unconventional low emission automotive propulsion systems (whether or not as a consequence of Federal intervention) is considered. A postulated 1976 Otto Cycle Internal Combustion Engine equipped with a dual catalyst manifold reactor and other conventional emission control devices is compared in detail with a Regenerative Free Turbine Engine and a Rankine Cycle Engine. Manufacturing costs, operating and ownership costs, consumer demand, interindustry effects, employment, resource requirements, and international trade implications are analyzed in depth under a number of plausible sets of policy constraints and parametric variations. Principal conclusions are that conversion over a 10-year period is feasible, that manufacturing cost differentials are less critical than fuel consumption and cost differentials, that industry/employment impacts are minor, and that resource/trade effects are dominated by petroleum imports. Government policy should be developed in the following areas to minimize possible adverse impacts of a vehicular power plant substitution, at least if such a substitution is brought about as a result of Federal intervention: spreading price increases over time to avoid nonrecoverable sales losses; scheduling to avoid disruption intermodel competition; scheduling to avoid severe employment dislocation; retraining of workers with obsolescent skills; and recycling of scarce materials. (Author abstract modified)

31946 **APTIC NO. 53854**

Mikesell, John L.

TAXES ON SULPHUR EMISSIONS AND GOALS OF SOCIETY. *Pub. Util. Fortn., 92(2):24-26, July 19, 1973. 5 refs.*

The proposed sulfur emissions tax and its social and economic implications are discussed. A major component of presidential efforts directed toward improved environmental quality is a charge on sulfur emitted into the atmosphere from combustion, refining, smelting, and other processes. A sulfur emissions tax would change the relative profitability of using high sulfur fuel, particularly coal, as a result of the incentive firms would have for sulfur emissions reductions. Two reactions are plausible: stimulation of technologies that reduce sulfur emission from given fuel supplies, either by extraction of sulfur from the fuel or from the emission; or a conversion of plants to lower sulfur content fuels. The tax would create an incentive for coal users to switch from high sulfur content coal to lower sulfur coal or to low sulfur fuels. This switch would reduce demand for the higher sulfur coal, and the burden of the switch would ultimately be felt by the residents of the areas producing this fuel and who have reserves of this fuel. Those regions which would be the most adversely affected are far from as affluent as the rest of the country. The importance of mining in the economy of these areas is quite high. The sulfur emission tax, initially and so long as S extraction technologies are not universally feasible, would augment the economic woes of these coal producing areas. The reduction of sulfur emissions in the areas to which this coal is shipped will be purchased at the cost of additional economic problems in some of the nation s lowest income areas.

31947 **APTIC NO. 53732**

Mrowec. Stanislaw, Guy Pawlowski, and Jacek Podhorodecki

STUDIES ON IRON CORROSION KINETICS OCCURRING IN SULFUR DIOXIDE. *(Badania nad kinetyka korozji zelaza w atmosferze dwutlenku siarki). Text in Polish. Zesz. Nauk. Akad. Gorn.-Hutn. Stanislaw Staszica, Ceram. Z., 22(329):75-87, 1973. 16 refs.*

The corrosion of iron in sulfur dioxide was studied at 1 atm and 650-950 C. Mass increases were noted with an accuracy of + or 0.0051 g. The actual stable constant surface of the metal equals the initial surface minus the proportion coefficient multiplied by the mass increase. The mass increase divided by the stable actual constant surface squared equals the parabolic constant of corrosion velocity times the reaction time. The slowest process determining the speed of sulfur oxide rust increase on iron is the diffusion of the reagents in the rust, similar to iron s reaction with oxygen or sulfur vapors. The increase was due to the rust diffusion of metal. The mechanism of the generation of the internal SOx stratum is not yet known. The activation energy of the corrosion process in sulfur dioxide and the parabolic constant of corrosion velocity values do not differ from sililar values for the reaction with oxygen. This indicates that the rust diffusion of the iron ions determines the kinetics of the rust increase. The external stratum constitutes the main mass of the rust. Therefore, the speed increase for the whole rust equals the speed increase in the external stratum.

31948 **APTIC NO. 53715**

Rothman, Richard

ACCESS VERSUS ENVIRONMENT? Traffic Quart., 27(1):111-132, Jan. 1973. 32 refs.

Four metropolitan area communities (two inner-city, one black ghetto, and one white affluent) of Chicago were selected for evaluation of Chicago s 1990 transportation plan with regard to the goals of improved accessibility to jobs and improved environmental quality. Analysis of the data for achievement matrices supports the notion that, in inner-city and suburban communities alike, the 1990 plan emphasizes access at the expense of environment. The net balance of benefits and costs in three of the four communities indicates that the plan will bring greater benefits than costs to those communities. However, a second glance shows the net benefit to be rather insignificant in relation to gross costs to environmental quality. The matrices also indicate that, with regard to access alone, suburban communities will be better off in 1990 than inner-city communities. An apparent pattern to the distribution of costs and benefits among user-types emerges in three of the study areas, viz., on their own terms, road users, transit users, and

pedestrians suffer environmental costs in their residential neighborhoods that far exceed the benefits they derive from improved access. It is only when visitors, state-wide taxpayers, and downtown businessmen enter into the calculation that the plan s benefits to the public-at-large are seen to slightly outweigh its environmental costs. The one community in which local residents do not bear heavy costs is the white, wealthy suburban community. Despite goals of improved access and environmental for all communities, comparative analysis shows that poor inner-city communities can expect to suffer comparatively heavy environmental deterioration with relatively small benefits to their residents from improved access.

1972

31949 **APTIC NO. 53930**

Environmental Protection Agency

THE ECONOMICS OF CLEAN AIR. *92nd Congress (Senate), Second Session, Doc. 92-67, 252p., March 1972.*

Cost estimates computed on a national level are given for controlling major air pollutants for most stationary and mobile sources. For mobile sources, three pollutants are covered -- carbon monoxide, hydrocarbons, and nitrogen oxides. For stationary sources, five pollutants are covered -- particulates, sulfur oxides, carbon monoxide, hydrocarbons, and nitrogen oxides. Three general classes of stationary sources are considered: solid waste disposal (open burning and incineration), stationary fuel combustion (heating and power generation), and industrial processes (17 types). Mobile source types included light-duty and heavy-duty road vehicle only. Stationary source control costs were projected for the five fiscal years 1973-1977. Mobile source control costs were given for the 1968-1977 model years to show the relative impact of increasingly more stringent federal standards since 1967.

STANDARDS AND CRITERIA

1973

31950 **APTIC NO. 53891**

Adachi, Yoshihiro

PROBLEMS OF AN EMISSION STANDARD FOR NITROGEN OXIDES. *(Chisso sankabutsu haishutsu kisei o meguru shomondai). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 2(9):27-31, Sept. 1973.*

Emission standards and control techniques for nitrogen oxides are discussed. About 90% of the emissions from nitric acid manufacturing facilities and about 30% of the emissions from a large boiler could be removed. A heating furnace could also be improved by modifying combustion. New boiler designs will reduce pollution in the future. With the development of new NOx prevention techniques in the future, the emission standards can be revised.

31951 **APTIC NO. 53929**

Jones, Kay H., John G. Holmes, and Robert E. Sampson

THE FEDERAL AIRCRAFT EMISSION CONTROL PROGRAM: STANDARDS AND THEIR BASIS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 29p., 1973. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-241.)*

The basis for the Clean Air Act amendments of 1970 that require the Environmental Protection Agency (EPA) to investigate the impact of aircraft emissions on air quality, determine the technological feasibility of controlling emissions, and develop emission standards for aircraft and aircraft engines based on the resultant findings are discussed. The determination of air quality impact, due to aircraft operations, involved several simultaneous approaches. These approaches involved: comparisons of emissions inventories in State implementation plans; area source analysis; statistical analysis of monitoring data; and modeling. The results of these approaches clearly indicated that aircraft operation causes or contributes significantly to the regional air pollution burden in the United States. Based on the positive impact determination EPA investigated the feasibility and costs of emissions control through changes in hardware and aircraft operation. As a result of information generated during this investigation, regulations were proposed which set exhaust emission standards for new and in use gas turbine engines and aircraft, prohibit fuel venting from gas turbine engines, set exhaust and crankcase emission standards for new piston engines, and establish test procedures to determine compliance with the standards. The EPA has indicated its intention to reduce emissions through the modification of aircraft ground operations procedures. (Author abstract modified)

31952 **APTIC NO. 53822**

Sano, Hiroshi

GOAL AND CONTROL TECHNIQUES OF NITROGEN OXIDES. *(Chisso sankabutsu yokusei no mokuhyo to taisaku gijutsu). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 40(8):729-738, Aug. 1973.*

The nitrogen oxides air quality standard has been proposed at 0.02 ppm for a 24-hour average 1-hour value, compared with the natural concentration of 0.003 ppm. The present annual mean values are 0.043 ppm in Sapporo, 0.064 ppm in Tokyo, and 0.053 ppm in Kawasaki. The NOx emission control goal is 50-100 ppm, the present emission standard is 200 ppm. Control methods include avoiding high temperature combustion (especially above 1800 C), reducing excess oxygen, obtaining uniform combustion, shortening high temperature residence time, and lengthening the residence time at NOx decomposition temperature (1000-1500 C). Presently it is difficult to reduce the NOx emission level to below 200 ppm. The present practical goal for NOx emission levels should be set at 100 ppm. Presently available NOx measuring techniques are summarized.

31953 **APTIC NO. 53865**

Saruta, Katsumi

AIR POLLUTION CONTROL IN YOKOHAMA CITY. *(Yokohama-shi no taiki ose taisaku). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 2(6):50-58, May 1973.*

Emission standards for sulfur dioxide, nitrogen oxides, and dust in Yokohama city are reviewed. The SO2 concentration in air must be below 0.03 ppm by 1975 and 0.015 ppm by 1977 as an annual average. Annual SO2 concentrations in Yokohama for 1966-1972 are tabulated and compared with air quality standards. Nitrogen oxides are emitted by automobiles, power plants, industries, and house heating. After 1975, NOx control will be attainable due to the development of a low pollution car. The use of liquefied natural gas in power plants has reduced NOx, SO2, and dust emissions. Fuel oil standards and emission standards for heating equipment are mentioned.

LEGAL AND ADMINISTRATIVE

1973

31954 **APTIC NO. 53739**

MACHINE INDUSTRY AND ENVIRONMENTAL PROTECTION. *(Maschinenindustrie und Umweltschutz). Text in German. Schweiz. Bauztg., 91(36): 871-972, Sept. 6, 1973.*

The Association of Swiss Machine Industries has questioned its 400 members to find out how much has been and will be invested in equipment for environmental protection. The highest amounts were and will be spent for air pollution protection measures. The industries invested 15 million dollars in existing plants and will spend another 6 million dollars to finish planned installations. Larger enterprises have their own personnel who specialize in the field. The industry is concerned about the slow spread of uniform guidelines. At present they differ from Kanton to Kanton and municipality to municipality.

31955 **APTIC NO. 53634**

Ball, Robert J., Eckardt C. Beck, Armando J. Carbonell, and Richard M. Dowd

NON-DEGRADATION OF AIR QUALITY: APPROACHES TO IMPLEMENTING THE POLICY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1973. 5 refs. (Presented at Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-182.)*

A conceptual approach to the issue of nondegradation of air quality is offered, and some of the basic areas of tension between land use planning and air quality protection are explored. As based on Connecticut s Air Quality Implementation Plan, different approaches to satisfying the requirements of nondegradation policies are discussed. The first approach is the three dimensional envelop, according to which pollutant concentration values for a critical time period are viewed as a surface, or envelope. Emissions may increase only to the extent that the envelope is not penetrated at any point. A second approach is the air quality contour, according to which numerous subregions are developed in conformance with pollutant concentration isopleths determined for a critical time period. Pollutant levels may not rise above maximum existing concentrations within each subregion. According to the modified air quality contour, subregions are developed as with the air quality contour, but they are modified to include flexible boundaries aimed at providing more long use options in urban-industrial core areas. The final approach is one of political subdivisions, according to which subregions are delineated on the basis of town, county, or regional planning agency boundaries. Maximum pollutant concentrations are then determined through modeling for each of the subregions. The following implicit air quality controls are contained in the above approaches: the control exerted by a hot spot (inferior to secondary standards) on a nondegradation region; and the control subregions have on each other. Both these controls may affect policy implementation. (Author abstract modified)

31956 **APTIC NO. 53629**

Becker, Brooks and Robert Ulrich

USE OF COOPERATORS FOR RAPID DEVELOPMENT AND ECONOMICAL MAINTENANCE OF A STATE AMBIENT AIR MONITORING NETWORK. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1973. 1 ref. (Presented at Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-262.)*

Three years ago, Wisconsin was faced with the problem of rapidly acquiring a clear picture of the ambient air condition throughout the state with a limited staff. To solve this problem, assistance was requested from state colleges and universities. These schools were well equipped to respond through their chemistry departments and student interest was high. The program has produced much useful data, quickly and at a low cost, especially for particulates and sulfur dioxide. The program now involves 17 schools which operate under the guidance and supervision of chemists on the state staff. The state provides instruments, materials, analytical methods, instructions, and funds for student salaries and small faculty stipends. Problems were encountered in establishing reliability of results, even though a central control laboratory provided control and test samples and tared filters. Initially, cooperators were limited to periodic monitoring which included primarily high-volume samplers and bubblers for sulfur dioxide, although some chose to go further and test for nitrogen oxides, ozone, hydrogen sulfide, or hydrocarbons of various types. Each cooperator was encouraged to do as much and go as far as student and faculty interest could support. More recently, cooperators have taken the responsibility of operating stations with continuous air monitoring instruments for six pollutants and meteorological parameters. Successful operation and expansion of this program has established it as an integral part of the state air pollution control agency. (Author abstract modified)

31957 **APTIC NO. 53902**

Braun, W. and H. Dau

IMPROVED AIR QUALITY THROUGH DEMANDING THE CONNECTION TO AND USE OF LOW-EMISSION LINE-BOUND HEAT SUPPLY - BUT HOW? (Verbesserte Luftqualitaet durch gezielten Anschluss- und Benutzungszwang zugunsten immissionsarmer leitungsgebundener Energietraeger - aber wie)? Text in German. Energie Tech., 25(8):201-205, 1973. 36 refs.

The right of municipalities in most states of the Federal Republic of Germany to demand the connection to and use of remote heating in cases of urgent public need is seen as the legal basis for a general improvement of the air quality in residential areas. The municipalities must be given standards for air quality in order to be able to decide when to demand the connection to remote heating. Emission tolerance limits must be worked out in connection with the meteorological conditions.

31958 **APTIC NO. 53803**

Cass, Glen R.

AIR POLLUTION CONTROL AGENCY PERFORMANCE EVALUATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1973. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-252.)*

A procedure is outlined for the rapid evaluation of air pollution control agency performance. To design guidelines for a comprehensive agency evaluation system, the air pollution control process must first be defined. The resulting control agency model is then translated into a systematic set of evaluation guidelines using a carefully designed questionnaire suitable for field use. Such a questionnaire would cover: external factors affecting an air pollution control agency s activities; agency manpower utilization for the fiscal year in question; agency accomplishments for the same fiscal year; and the rate at which an agency is reducing its total load of violating sources, as indicated by agency procedures, resources, problems, and accomplishments. Computerized data reduction quickly indicates agency effectiveness, efficiency, and costs, especially compared with other agencies similarly situated. Comments for program improvement are developed by the evaluator, with preparation of the final report on each agency evaluated being assisted by the computer s high speed printing capabilities. This evaluation system was field tested at 32 state and local air pollution control agencies in the southwestern United States. Selected example results indicate the average differences between the performance and structural characteristics of the agencies surveyed. (Author abstract modified)

31959 **APTIC NO. 53638**

Coblenz, Jack G. John J. Roberts, and Gary L. Melvin

A PLAN TO REDUCE CARBON MONOXIDE LEVELS DURING AIR POLLUTION EPISODES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1973. 13 refs. (Presented at Air Pollution Control Association, An-*

nual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-216.)

A plan for reducing the concentration of carbon monoxide and other vehicle-related pollutants during air pollution episodes is discussed. The plan involves taking positive action at each of three alert stages. In a large city such as Chicago, the highest levels of carbon monoxide are found in the central business district (CBD) and at certain expressway intersections. During the first alert stage of an air pollution episode, a reduction of CO in these areas is brought about by staggering the working hours of governmental employees, cancelling road repairs, delaying bridge openings, curtailing emissions from stationary sources, having traffic control officers take extraordinary measures to speed up the flow of traffic, and issuing news bulletins discouraging the public from driving in the area. During the second alert stage, in addition to continuing the previous actions, all nonessential governmental offices are closed, major employers stagger their working hours, taxicab and truck operations are restricted, and parking lots in the CBD are closed. If third stage levels are reached, an emergency is declared and all stores, offices, factories, and other places of business in the affected area are required to cease their operations, thus eliminating the need for most people to be traveling in the area. It is eexpected that during the first alert stage emissions will be reduced by 33%, during the second by 50%, and during the third by 65%. (Author abstract)

31960 **APTIC NO. 53639**

Crane, George B.

KRAFT PULPMILL EMISSION CONTROL PROCEDURES DURING AIR POLLUTION EPISODES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 29p., 1973. 9 refs. (Presented at Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-215.)*

The reduction in particulate, sulfur dioxide, and total reduced sulfur (TRS) emissions from a model kraft pulpmill was calculated for various actions which might be taken during an air pollution episode. In the first stage of such an episode (forecast), a 500 ton/day pulpmill should prepare to switch the power boiler or combination boiler to lower sulfur fuels and prepared to reduce operations if the plant or other units is operated above design capacity. During the second stage (alert) the pulpmill should in addition, discontinue open burning; use incinerators and perform boiler lancing or soot blowing only between noon and 4:00 pm; increase the amount of bark and decrease the amount of coal or oil burned in the combination boiler; and cut back the recovery furnace from 125 to 100% capacity. Additional measures during the third stage (warning) involve: switching from coal and bark, or oil and bark, to gas fuel in the combination boiler; reducing operations somewhat and cutting the lime kiln load from 120 to 90% capacity; and cutting back the recovery furnace from 100 to 80% capacity. The final stage (emergency) requires: shutting down all plants without high efficiency controls; and preparing to shutdown all plants (making no new cooks). For economic reasons, the strategies to be followed during an air pollution episode should be carefully preplanned, using a computer if required. Such preplanning involves determining the interrelationship of equipment pieces with respect to production rates. Additional requirements are: instruments that can sense a pollutant, transmit a signal, and operate a control valve; information regarding particulate evolution versus loading for boilers and pulpmill lime kilns; information regarding pollutant evolution when production rate is changed; emission data, especially regarding particulates; written plant operating instructions and actions to take place during an air pollution episode; and information on costs involved in episode induced curtailments and shutdowns.

31961 **APTIC NO. 53832**

Dirkes, George E.

THE AIR POLLUTION CONTROL SYSTEM AND THE AGGREGATE INDUSTRY IN ILLINOIS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 11p., 1973. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-335.)*

Aggregate production is the largest facet of the mining industry in Illinois and is subject to a wide variety of local, state, and Federal regulations. In an attempt to deal with these regulations the operators of stone quarries and gravel pits are getting involved in their communities, taking the approach of correcting the appearance of their operations, policing themselves, and making a conscientious effort to comply with the rules and regulations provided by the state authority. However, certain problems have been encountered with regard to these regulations: some of the regulations and their deadlines are unrealistic; the amount of paper work involved is formidable; unclear procedural instructions and interpretations have caused confusion among permit applicants; and a credibility gap has been created whereby some operators feel that the standards applied to the aggregate industry are more strict than those applied to other industries. To provide an efficient and fair state air pollution control program, it must first be determined what the real emission factors from aggregate operations are, what is an acceptable level of emission, how harmful aggregate pollution is, and what the value of the product is relative to the pollution or nuisance caused by the product or service.

31962 **APTIC NO. 53631**

Feldstein, M., D. A. Levaggi, and R. Thuillier

ODOR REGULATION BY EMISSION LIMITATION AT THE STACK. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1973. 11 refs. (Presented at Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-273.)*

Diffusion calculations in accordance with Larsen s model were used to establish emission limits for several specific odorous substances. The limits were designed to assure that downwind concentrations above the odor threshold for 3-minute periods would not occur more than once in a year. These concepts were incorporated into a regulation limiting the emission of trimethylamine, phenol, dimethyl sulfide, methyl mercaptan, and ammonia; this regulation was adopted by Californias Bay Area Air Pollution Control District. Methods for sampling these substances include absorption and collection in Tedlar bags. Gas chromatographic and colorimetric procedures can then be used to measure them. The regulation offers the advantage that other specific substances may be added to the list of controlled materials as information on their community effects becomes available and as methods for their determination are developed. It has the disadvantage that odorous substances which cannot be chemically identified cannot be regulated by this procedure. Additional regulations on odor control using classic olfactometry methods to handle this latter group of substances are currently under development. (Author summary modified)

31963 **APTIC NO. 53633**

Feldstein, M., M. Macomber, H. Harawitz, R. Mead, A. Norris, and R. Thuillier

AIR QUALITY MODELING FOR LAND USE PLANNING AND CONTROL APPLICATIONS - AN INTERDISCIPLINARY APPROACH. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 20p., 1973. 4 refs. (Presented at Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-187.)*

In accordance with the 1970 amendments to the Clean Air Act, the Bay Area Air Pollution Control District is actively pursuing air quality constraints on land use (including transportation) as a means of achieving Federal and State air quality standards. District regulations presently require denial of permits to construct or operate facilities which exceed emission limits, but machinery has been created to explore the broad range of land use planning techniques and alternatives from the air quality control standpoint with the goal of meeting and maintaining air quality standards. The nucleus of the District s effort in this regard is a unique multidisciplinary research and planning group whose mission is the modeling of land use impact on air quality. By relying on simplified state of the art modeling techniques, concurrent activities in application and research are possible. Through continuous liaison with governmental and planning agencies outside the District, a balanced input to the modeling process is sought. The initial task is to relate land use to emissions and emissions to an annual statistical distribution of air quality levels with a resolution of 1 sq km. The ultimate goal is the development of a rational policy for air quality based land use planning in the Bay Area, employing the concept of locally resolved emission density limitation. Climatological dispersion and statistical modeling techniques have been combined with a specialized emissions inventory analysis and prediction program. Innovative techniques involving canonical correlation and intuitive logic are being explored. Maximum effort is expended in the simplication of techniques to encourage and facilitate their application. (Author abstract)

31964 **APTIC NO. 53628**

Feuss, James V. and Raymond F. Bell

EVALUATING EVALUATORS EVALUATIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 20p., 1973. 18 refs. (Presented at Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-253.)*

Some of the concepts of air pollution control program evaluation are reviewed, and a framework and set of definitions for mission, goals, objectives, priorities, policies, and evaluations are established. The purposes of evaluation are to give administrators some indicators of the impact their various programs are having, to justify in economic terms the program under evaluation, and to find areas that could be improved. The following preconceptions should be avoided by governmental program evaluators; one s own level of government is best equipped to deal with the given problem; the level of government best equipped to finance and assume the actual operational phase of the program is a level other than one s own; and one is doing the best job possible and will not benefit from any other internal or external evaluation procedure. Not only must the objectives of the programs be clear, so must the objectives of the evaluation. The evaluation technique itself may be as important if not more important than any written report that may result from the evaluation effort. A good evaluation program should lead to: acceptable techniques or solutions to the identified problems; the formulation and consideration of alternative methods for accomplishing the goals and objectives; and the formulation of a surfacing technique for meaningful data. Further, the evaluation should be based only upon meaningful data. (Author abstract modified)

31965 **APTIC NO. 53737**

Garscia, Edward

ORGANIZATION OF ENVIRONMENT PROTECTION IN LENIN STEEL-WORKS. *(Organizacja ochrony srodowiska w hucie im. Lenina). Text in Polish. Zesz. Nauk. Akad. Gorn.-Hutn. Stanislawa Staszica, 47(400):159-165, 1973.*

The development of the Polish Lenin steelworks and new forms and methods of environmental protection management are discussed. In order to improve the working conditions for the employees and to protect the environment, measures were taken since 1961 to control air and water pollution. The measures taken included; special working units designated from among the maintenance personnel to take care of the exploitation and conservation of the ventilation and purification installations; working out of annual departmental plans for improvement of the ventilation, dust purification, and sewage control systems; organizing of periodical rationalization competitions in the domain of water, air, and noise pollution; creating a specialized team for estimating the progress achieved in the fight against pollution; organizing the supply of installations based on previous results obtained; systematic measurements of emissions to the atmosphere pollutants in sewage; introduction of in-plant pollution standards; and cooperation with numerous research institutions, specialized in environmental protection problems. A new position was created on Jan. 1, 1968, that of Assistant Main Energetics Engineer in charge of all activities concerning water, air and noise pollution. A simplified organizational diagram of the department of the Main Engineer in charge of the Environmental Protection problems is provided. The general manager is responsible for the works production and the Technical Protection engineer is responsible for the working conditions and environmental protection.

31966 **APTIC NO. 53781**

Grave, A. de

THE ROLE OF THE BUILDING ADMINISTRATION IN THE FIGHT AGAINST POLLUTION. *(De rol van het bestuur der gebouwen in de strijd tegen de verontreiniging). Text in Dutch. Ann. Travaux Pub. Belg., no. 1:7-15, 1972-1973.*

The role of the Belgian Building Administration, cooperating with private design and construction companies, in the fight against pollution, and specifically in air and noise pollution control, as well as in heat insulation, is described. The Building Administration closely cooperates with the Belgian Institute of Standardization in the elaboration of standards concerning the design of heating equipment, fuel standards, and sound and heat insulation. A minimum flue gas flow rate of 3 to 5 m/sec is required for heating equipment. Efforts to increase the efficiency of heating equipment has also contributed to air pollution abatement. The flue gas opacity, measured by means of Bacharach opacimeter, is required not to exceed specific values as a function of the actual fuel. In most cases, the opacity must not exceed Bacharach 3. Heavy and extra-heavy fuel oil with reduced sulfur content is required for large capacity heating equipment operating at high temperature.

31967 **APTIC NO. 53825**

Hamburg, Fredric C. and Charles W. Whitmore

ACCIDENTAL EPISODES: A ROLE FOR THE AIR POLLUTION CONTROL AGENCY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 25p., 1973. 22 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-211.)*

The contribution that can be made by the local air pollution control agency during an accidental air pollution episode is discussed. The key element in the advance preparation for handling all types of such disasters is a comprehensive contingency plan for community action. As envisioned, the principal roles of the agency in such a plan are in support functions, mainly in air quality surveillance and hazard area estimation. Surveillance includes detection, identification, and monitoring of hazardous vapor concentrations by means of a detection kit or by grab sampling and chemical analysis performed in a mobile laboratory on the scene. Hazard area estimates based on a method described in Turner s Workbook should be a particular specialty of these agencies. This function can be facilitated by the use of templates that are designed to be superimposed over large scale USGS maps of the stricken area. The templates provide rapid estimates of the hazard area corresponding to each of the 15 top ranked hazardous windborne chemicals that could be expected to be encountered in accidental episodes; these estimates are based upon ACGIH emergency excursion limits. Agencies are urged to aid in the preparation of a formal contingency plan which makes provision for APC participation. In addition, the agencies should upgrade their existing capabilities and procedures to provide maximum support through the medium of the plan. (Author abstract modified)

31968 **APTIC NO. 53806**

Hamming, Walter J., Robert L. Chass, Janet E. Dickinson, and William G. MacBeth

MOTOR VEHICLE CONTROL AND AIR QUALITY: THE PATH TO CLEAN AIR FOR LOS ANGELES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1973. 25 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-73.)*

The following independent methods have been utilized by the Los Angeles County Air Polluton Control District in evaluating the degree of control required to achieve the air quality standards in the County: district irradiation chamber studies; irradiation chamber studies by Dimitriades; and the evaluation of atmospheric data. The results indicate that the oxidant standard can be attained by 1980 if the vehicle emissions control program contemplated by the state is implemented and enforced as planned. The Federal oxidant standard can be met provided the ratio of oxides of nitrogen to hydrocarbons actually emitted by autos is greater than four using infrared-2 to measure HC as hexane, or greater than 1/2 using flame ionization to measure the HC concentrations as carbon atoms. If g/mi are used, the ratio must be greater than 1.5. The 1976 Federal exhaust standards will not allow attainment of these ratios. The 1975 Federal exhaust standard for NO will not allow compliance with the Federal annual average air quality standard for nitrogen dioxide. By 1978, the atmospheric situation will be such that compliance with the air quality standards for NO and NO2 may be possible at that time. Societal options such as gas rationing will not achieve clean air as defined by EPA. There must be an excess of NO emitted in order to sequester both the ozone formed and the natural ozone in the air, and the NO must be emitted together with the hydrocarbons. (Author summary modified)

31969 **APTIC NO. 53735**

Krieger, James H.

LEGAL ASPECTS OF ENVIRONMENTALISM. *J. Am. Water Works Assoc., 65(8):532-537, Aug. 1973. 5 refs. (Presented at the American Water Works Association Conference, Annual, Riverside, Calif., June 6, 1972.)*

Legal aspects of the National Environmental Policy Act (NEPA) of 1969 are discussed. The NEPA requires all Federal agencies to disclose the effect that their proposed actions will have on the environment. The agencies are required to prepare environmental impact statements and to file those statements with the council on Environmental Quality before taking any action. The Atomic Energy Commission was one of the first agencies sued by environmental groups and was compelled to follow NEPA guidelines concerning a proposed nuclear power plant. Other court decisions in favor of NEPA include delaying the trans Alaska oil pipeline and the Navajo power plant, although it was planned before NEPA. There is need for flexibility in NEPA. Amendments were posed to the Atomic Energy Act that will authorize temporary operating licenses for nuclear reactors where an environmental analysis has been proposed that is short of the full review required by NEPA. Legislation to exempt the 1899 Refuse Act from NEPA was introduced because the courts ruled that no permit to discharge wastes in navigible waters could be issued without an environmental impact statement for each permit.

31970 **APTIC NO. 53921**

Morrison, Rayburn M., David Forehand, and Arnold Stein

INSPECTIONS TO PERMIT APPLICATION REVIEW. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1973. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-256.)*

The relationship between the review and inspection in the operation of permit systems is discussed. In most cases, a permit to construct, install, or modify is issued before any inspection is made, but on site inspection is necessary. A permit authorizes a strictly defined action and does not present carte blanche for the holder to do as he pleases. On site inspection is the only way the agency can assure itself that information and specifications in an application describe the facility correctly. Inspections during the construction of the facility are a good method of preventing violations rather than detecting violations after commission. At the completion of construction, additional inspections are needed to evaluate the permit to operate application. These inspections are concerned mainly with determining the actual amount of air pollution caused by operation of the facility. Complexity of the inspection is determined by the new installation. At times a stack test during normal operation will be required; at other times a detailed examination of all facets of the operation will be necessary. It is doubtful that many permit applications can be completely analyzed without an inspection of the proposed site or without a prior review of the construction plans, although some can be. Preconstruction review of plans will give reasonable assurance of adequately designed control systems. On site inspections will ensure that emission regulations are obeyed, air quality standards are not exceeded, and nuisances are not created. (Author conclusions modified)

31971 **APTIC NO. 53748**

Musche, R.

ENVIRONMENTAL PROTECTION - MEASURES AGAINST MERCURY AND CADMIUM POLLUTERS IN THE FEDERAL REPUBLIC OF GERMANY. *(Umweltschutz - Massnahmen gegen Quecksilber- und Cadmiumkontaminanten in der Bundesrepublik Deutschland). Text in German. Bundesgesundheitsblatt (Berlin), no. 18:264-268, Sept. 7, 1973. 14 refs.*

The environmental pollution of water, air, and food by certain industries is controlled in West Germany by the Industrial Regulations. Special regulations such as the Federal Emission Protection Law and the Water Control Law are either in preparation or have been issued already. The Federal Government is financing a program which is to be carried out in three steps. It includes the determination of the extent of the pollution of water air and food and a study concerning the effects on man, plants, and animals, a monitoring program, and development of methods for the reduction of pollutants. The degree of air pollution by mercury and cadmium must be determined with special regard to local conditions. The studies are not concluded yet. As a source for cadmium emissions, the combustion of lubricating, diesel, and fuel oils, which amounts to between 70 and 530 ppb, assumes special importance.

31972 **APTIC NO. 53927**

Robison, Charles B., George E. Hardy, Jr., Richard E. Grusnick, James L. Carroll, and Francis L. McCormick

AIR POLLUTION EPISODE CONTROL IN JEFFERSON COUNTY (BIRMINGHAM), ALABAMA. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1973. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-213.)*

The events of the Birmingham, Ala., air pollution episode of Nov. 1971, which resulted in the first use of the injunction authority contained in the Federal Clean Air Act and the subsequent abatement strategies are discussed. On Nov. 16, 1971, particulate levels for the preceding 24 hr in Jefferson County were 771 micrograms/cu m, and the County Health Department declared an air pollution alert. Twenty-three major sources of particulate emissions were asked to make voluntary reductions in particulate output. Twenty-four hours later the particulate level was at 758 micrograms/cu m. The State Air Pollution Control Commission had been established only 48 hr before the episode and had no practical legal recourse to stop the emissions by local industry. Therefore, state and local officials used the injunctive authority of the Clean Air Act and a restraining order was issued Nov. 18. Six hours later the particulate level dropped to 410 micrograms/cu m, and by Nov. 19, the level was at 217 micrograms/cu m. The Jefferson County Air Pollution Control Rules and Regulations were officially adopted on Jan. 28, 1972. An episode was defined and a four stage declaration system established: Episode Watch, Episode Alert, Episode Warning, and Episode Emergency. The overall reduction at each stage after full implementation is 31% at Alert, 64% at Warning, and 94% at Emergency. There were three episodes in 1972, and industry cooperated. The plans successfully combated rising levels of air contamination to the satisfaction of both local health officials and local industry.

31973 **APTIC NO. 53925**

Sacco, John F.

COMMUNITY LEADERSHIP AND AIR QUALITY IMPROVEMENT: A STUDY OF THIRTY-SEVEN CITIES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 29p., 1973. 29 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-353.)*

The relationship between community leadership and air quality improvement was investigated in 37 cities. Total suspended particulate matter was recorded at one site in each of the 37 cities from 1957 to 1970. There was a negative correlation between the influence of local industry and air pollution improvement, but the correlation was only -.21. The strongest negative impact on improvement came in those cities where local community leaders put a high valuation on business and industrial development. The strongest positive impact came in those cities where the local newspaper or mayor took procontrol stands. Activity by the political parties, the labor unions, and chamber of commerce had far less impact. Of particular significance is the perceived clash between economics and environmental control. Long term involvement is needed for two reasons. First, joint involvement at the crisis stage may, as in the case of the wage board, produce further conflict. Second, long term involvement may ward off some crises. Joint involvement may ward off some of the skepticism that is often apparent when research is produced by a single interest group. (Author abstract modified)

31974 **APTIC NO. 53725**

Schweizer, Jacques

INDUSTRIAL POLLUTION CONTROL MEASURES: LEGISLATION COMPARISONS. *(Les mesures contre les pollutions industrielles: legislations comparees). Text in French. Mines Metallurgie, (102):46-48, April 1973.*

Legislative acts of the various countries that participated at a discussion in Strasbourg in March 1972 are compared regarding air pollution. Belgium has given its monarch power to take all the necessary steps to combat air pollution. Great Britain has had its Alkali Act since 1906 to regulate exhaust emissions, dust, and soot with inspections on the average of four times a year. The Public Health Ministry of West Germany has already set maximum allowable concentrations for dust, gases and vapors, a method to measure sulfur dioxide concentrations, and calculations of minimum height of smoke stacks. The United States Department of Health, Education, and Welfare is to designate regions requiring air quality control programs funded by the Federal government. The Clean Air Act of Dec. 1970 is designed to intensify air pollution control programs. The Environmental Protection Agency was created in the U. S. Japan drew up its first air pollution control law in 1962. A bill, passed Nov. 10, 1968, regulates smoky soot emissions.

31975 **APTIC NO. 53864**

Taguchi, Katsuhisa

PRESENT ASPECT OF IBARAGI ENVIRONMENTAL POLLUTION TECHNICAL CENTER. *(Ibaragi-ken kogai gijutsu senta no genkyo). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 9(4):388-395, April 1973.*

The Ibaragi Pollution Technical Center consists of five divisions for air, water, and nuclear pollution control. Each division monitors, inspects, directs, and advises. Analytical apparatuses used by the Center are described. Air pollution is monitored by 12 stations which report to the Center by a telemeter. Monthly sulfur dioxide and dust concentration for 1971 and 1972 are shown; the relatinship between their variation and meteorology is discussed. Data concerning exhaust gases, noise, odors, and photochemical smog are given.

31976 **APTIC NO. 53683**

Westman, Walter E. and Roger M. Gifford

ENVIRONMENTAL IMPACT: CONTROLLING THE OVERALL LEVEL. *Science, 181(4102):819-825, Aug. 31, 1973. 51 refs.*

A rationing system that may control environmental impact while maximizing personal choice is described. It is suggested that by assigning a price to every resource use and activity (including childbirth) that causes environmental impact in money independent units (NRU s), a new system of environmental trade-offs can be established which maintains maximum personal choice within overall environmental constraint. The social equality of the system in relation to resource exploitation would be enhanced by distributing NRU rations equally among the population each year. Special means of controlling industrial and organizational use of resources through NRU s are also discussed. The system is believed to offer a more sensitive means of gauging social priorities in relation to resource use than that achieved by an exclusively monetary system. Although involving more planning and more governmental regulation than is currently deemed feasible or acceptable, it is believed that the mechanism would lead to less restriction of personal freedom in a steady state society than would the current trend toward unsystematic imposition of governmental regulations. (Author summary modified)

1972

31977 **APTIC NO. 53943**

Dept. of Transportation, Atlanta, Ga., Federal Highway Administration

PROJECTS I-75-3(2) 291 P. E., I-75-3(3) 270 P. E., COBB-CHEROKEE- BARTOW COUNTIES (EIS). *586p., March 22, 1972.*

NTIS: 204462-F

An environmental impact statement is presented about the proposed completion of the remaining 24.3 mile gap in Interstate-75 in the vicinity of Lake Allatoona between Roberts Road in Cobb County and route 411 in Bartow County, Georgia. The project makes up the last link in Interstate-75 in Georgia. The proposed project action to complete the route is described. Adverse environmental effects, alternatives to the proposed action, local short term and long term uses of the road, and the irreversible and irretrievable commitment of resources are reviewed. Steps taken to minimize harm are discussed.

1949

31978 **APTIC NO. 53711**

McCord, Carey P. and William N. Witheridge

THE MAKING OF AN ODOR SURVEY. *In: Odors - Physiology and Control. New York, McGraw-Hill, 1949, Chapt. 22, p. 252-256. 1 ref.*

The proper steps necessary for making an odor survey are likely to include: investigation of the complaints made; investigation of the physical factors involved; investigation of the detected source; determination of remedial measures and their application; and appraisal of possible legal procedures. Investigation of the physical factors involved should include: a study of the terrain; noting the season of the year; temperature; variations in wind direction; the presence of streams (with particular reference to pollution); the extent and state of vegetation; the nature of industrial activities and their distances from involved areas; the presence of dumps, burning waste piles, and kennels; the number of smokestacks; and the nature of highway, rail, and water traffic. Further examination of the detected source should be extended to: the work processes involved, the duration of the operations, disposal methods for wastes, control methods for gaseous and vaporous wastes, determination of the exact practices leading to odors, examination of the methods and maintenance of odor-controlling installations, and appraisal of the magnitude of the odor problem.

31979 **APTIC NO. 53712**

McCord, Carey P. and William N. Witheridge

THE LEGAL ASPECTS OF ODOR NUISANCES. *In: Odors - Physiology and Control. New York, McGraw-Hill, 1949, Chapt. 23, p. 257-272. 4 refs.*

Some observed weaknesses in the plaintiff's approach to seeking odor elimination by legal action are: exaggeration of true facts, the attributing to odors actual diseases that palpably could not have derived from odors, denial of the existance of other odors in a community, the lack of a specific date for fixing the complaint, direction of complaint to a single unit of industry to the exclusion of others, and loss of objectivity by qualified official witnesses in hysteria-charged courtrooms. Some nuisances that have attracted attention in court, notwithstanding the legal difficulty of fixing the definition for nuisance, are: odors, smoke, dust, toxic or irritating chemicals, fume, steam, burning dumps, and various air-polluting industries. Remedies at law available against nuisances, legal responsibilities of political units, and brief abstracts from outstanding legal cases involving odors are set forth to assist the prospective plaintiff or defendent in his course of action.

SOCIAL ASPECTS

1973

31980 **APTIC NO. 53819**

Niki, Haruko

PHOTOCHEMICAL PROBLEM FROM THE STANDPOINT OF MOTHER. *(Hahaoya no tachiba kara mita kokagaku sumoggu mondai) Text in Japanese. Seikatsu to Kankyo (Life Environ.), 18(8):45-48, 1973.*

Questionnaires on photochemical smog problems were prepared by two concerned mothers and were distributed to the residents in Suginami ward of Tokyo. In 465 returned answers, 74% were aware of the deterioration of air in the area and 51% were aware of photochemical smog. Only 0.8% of those who were aware of the photochemical smog had made some kind of report to the health department of the ward. Fifty percent of the residents reported sudden changes of their house plants including the change of color and falling leaves. Most of the residents believed that the photochemical smog could be reduced through more strict regulations on automobile emissions. The concerned mothers appealed for better management of the local health department.

31981 **APTIC NO. 53924**

Prah, Delmar H., David L. Brenchley, and Harry R. Potter

RESPONDENTS PERCEPTION OF AIR QUALITY IN INDIANAPOLIS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1973. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-355.)*

Air quality attitudes of 223 persons in Indianapolis were surveyed and compared to daily ambient air quality measurements. A Thurstone type procedure was used to select items used in a Likert scale of awareness of air pollution, with the results correlated with Guttman scales of awareness and recognition of air pollution. Seventy-three percent expressed concern about the seriousness of air pollution in Indianapolis. Television was rated most effective in relaying concern about air pollution. Dust and dirt in the air was the most noticed aspect of air pollution, followed by nose and throat irritation, frequent malodors, fog and haze, and eye irritation. About 58% thought industry ought to first be given the chance to clean up its air pollution, with 50% imploring public officials to take action next. Seventy-five percent agreed that polluters should pay the cost of clean up directly. Only 3% did not know what could be done about air pollution. No significant relationship was observed between suspended particulate mass concentration and questionnaire variables. Respondents generally limited their conscious identification of air pollution sources to point sources within 5 or 6 km of their residences. Motor vehicles were a major source to 52%. Air pollution seemed to be a more serious problem for those who disliked their own neighborhoods. Awareness of air pollution positively correlated with education and income, and negatively with age. The different scales of awareness were essentially undimensional by their mutually strong positive correlations among the two Guttman scales and the Likert scales on similar dimensions. (Author abstract modified)

GENERAL

1973

31982 **APTIC NO. 53740**

Hess, W

AIR POLLUTION IN THE CITY OF ZURICH. *(Luftverschmutzung in der Stadt Zuerich) Text in German. Schweiz. Bauztg., 91(36):860-861, Sept. 6, 1973.*

For more than 10 years the air over Zurich has been chemically analyzed. Initially the measurements were sporadic, now they are continuous. The results indicate that gradually but clearly air pollution has worsened. Domestic heaters and traffic are mainly responsible for this. More than 50% of the city's oil heaters are either old, badly designed, or badly serviced. The country lacks qualified personnel. For the 450,000 oil heaters of the country only 1000 specialists are available. The rising air pollution by automobiles is due to the increase of the traffic density and to an astonishing degree of lack of concern about pollution by the manufacturer and owner alike. Exhaust gas analyses carried out in Zurich showed that more than half of the gasoline operated cars had an inadmissibly high carbon monoxide concentration despite the 1971 regulations. In the majority of cases the carburetor is still adjusted manually without the use of measuring instruments.

31983 **APTIC NO. 53653**

Rushin, Eugene

SMOG PULVERIZING MACHINE. *(Assignee not given.) U. S. Pat. 3,715,864. 7p., Feb. 13, 1973. 4 refs. (Appl. May 13, 1971, 6 claims).*

A smog pulverizing machine for the dispersal of smoke into the atmosphere from industrial and commercial sources has been designed to dilute the smoke, put it under pressure, and then relieve it into the atmosphere at predetermined conditions of heat, pressure, oxidation, and velocity. Smoke from a furnace is drawn by pumps into a mixture with a flow of warm air, and the resulting mixture is serially pumped into a first chamber. Float valves relieve this first chamber into a second or high pressure chamber; and when these valves are sufficiently pressed downwardly by pressure in the second chamber, solenoid actuated valves in the second chamber are opened to relieve the mixture at relatively high pressure and velocity into the outside atmosphere. The solenoid actuated exit valves are provided with an apparatus to remain in a locked open position until the float chambers rise sufficiently to deactuate this locking apparatus. (Author abstract modified)

31984 **APTIC NO. 53892**

Watanabe, Senjin

THE STEP OF MANKIND AND THE CHANGE OF ENVIRONMENT. *(Jinrui no ayumi to kankyo no henbo). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 2(8):541-555, Aug. 1973.*

Increased population, economic expansion, and industrialization cause consumption of resources, waste production, air pollution, and changes in the natural environment. The changes in the natural environment could cause irreversible destruction of the ecosystem. The present trend is that hostility, competition, insincerity, and destruction of the natural environment will continue to increase, while goodwill, fellowship, mutual consideration, and cooperation will decrease.

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